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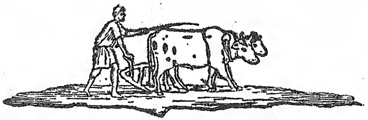
THE
ALLAHABAD FARMER



VOL. XIII] JANUARY, 1939 [No. 1.

An Editorial

The Philosophy of an Agriculturist.

Many of us who have worked with the Indian cultivator must, on many occasions, have been sorely disappointed with the results that we have achieved in our attempts to improve his lot. The failures and consequent disappointments have more often been ascribed to the conservatism of the cultivator. However, more recently we are beginning to understand as to why the Indian cultivator seems to be more conservative than some of his contemporaries of the West. The margin of profit, nay the margin between life and death, of an Indian cultivator is so small that it would take a great deal of courage on his part to experiment with new ideas, or to substitute new methods for well-tried ones which have stood the test of time throughout all these centuries that India has maintained to live. One can, therefore, very well sympathize with the Indian cultivator who seems to be averse to new ideas or new methods.

However another reason, and it seems to us a very important reason, which makes the cultivator appear incapable

of improvement is, to our minds: his attitude towards life; his philosophy of life. First of all we find in the Indian cultivator an absence of a forward or an upward look. It is true, however, that whatever ambition he had had before, that has been killed out by the unfavourable circumstances in which he is placed, so that he thinks there is no chance for improvement. It is for that reason, we believe, that the doctrine of fatalism has found a very congenial soil in the minds of our Indian cultivator. However, this must be rooted out if the urge for improvement and for better living, must come to the Indian farmer. The Indian farmer must be made to understand that diseases of men, as well as of their cattle and their crops, do not happen because it was designed that this should be so, but because these are part of nature and that man has power to control them.

Another weighty reason, which follows from the above, and which appears to us to be another impediment to much progress in our countryside, is the fact that the Indian cultivator considers himself one of the teeming millions which nature has produced in this great big world in which we live, and that he is more or less on the same level with them. The cow, the goat, the monkey, the rat, these are all God's creations made equal with man. There is a complete lack of the idea that man may be a master, nay a lord of creation How indifferent India would be if our Indian cultivator can get a glimpse of the philosophy involved in this simple statement of Jawaharlal Nehru, "I would like to command nature and conquer it rather than be slave to it". If India could take in the following command of God given to the first man, "Be fruitful and multiply, and replenish the earth, and subdue it, and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth", we are sure that a new dawn would have arisen in the rural life of India.

What is science but an attempt to understand nature and to use it for man's benefit? Nature is here to serve man Man's failure to understand nature will simply result in the extinction of the species. It is for that reason that

we believe the Indian cultivator must sooner or later understand the part that each one of God's creatures has to play in order to make man's life in this world worth living. Should we, for instance, leave the rat alone when science has shown it to be one of the greatest enemies of man? It has been estimated that the citizens of New York State pay Rs. 27,500,000 a year for damage done by rats. It would be interesting to know how many crores of rupees and how many human lives India is paying for damage done by these animals. It has been estimated again that rats have caused more deaths than all the wars of history.

The damage done to crops by birds is enormous. It must again amount to several crores of rupees every year. Yet bird control has scarcely been thought of in this country.

Other countries of the West, especially America, have sent emissaries far and wide in order to discover enemies of insect pests in their countries. Tiphia, a wasp, has been discovered to effectively control the Japanese beetle which does a great deal of damage to the fruit industry of the United States of America; tigers have been imported to Australia to control rabbits; certain lady-bird beetles have been reared as they are known to destroy aphides, a group of insects most destructive to our *rabi* crops such as wheat, mustard, barley, etc. These same beetles are also known to destroy the San Jose Scale so destructive to the apple industry in Kashmir and other parts of the world wherever apple is grown. Other countries have allowed uneconomic cattle to die out. When will our country, India, wake up to the fact that in order that man should live, his enemies should be destroyed and his friends taken care of!

The Allahabad Farmers' Fair.

The annual fair of the cultivators of the Allahabad district is being held again this year at the Allahabad Agricultural Institute from the 23rd to the 25th of February. While the fair is meant more especially for the farmers, there will be interesting exhibits for the educated public especially for those who are interested in various phases of rural reconstruction.

AGRICULTURAL IMPLEMENTS INDIA SHOULD ADOPT AND WHY

By

Mason Vaugh

Agricultural Engineer, Allahabad Agricultural Institute.

The subject is capable of various treatments. First it would seem to limit the kinds of implements to be adopted Should this limit be permanent or should it be a sliding limit, changing with progress and passage of time? Again, the why part could be discussed from various angles, economic, social, perhaps political.

As a first principle, I think we can all agree that any change in agricultural methods and practices must be gradual. Even where the process is accelerated as much as possible, it is necessary to have five-year plans which in themselves are partial and designed to reach certain objectives within defined time limits, not to complete the process. The purpose of all implements, tools and machines is to increase the productive capacity of the individual. We now have an economy geared to the productive capacity of the population which in turn is limited by the tools with which we work. Any change in one part of this set up will mean re-adjustments elsewhere. These re-adjustments in human life require time to carry out and if they proceed too rapidly we have an Industrial Revolution with the suffering resulting from any revolution. Therefore, any plan of change in the implements and machines in use in India should be based on a gradual change over in successive stages, probably spread over several generations. A plan, however, will be better than "letting nature take its course".

If the above is accepted, changes must be gradual, continuing and probably more or less unending. Eventually they must take place in all phases of life. Restricting ourselves to agriculture, if the highest good is to be reached, every operation done by the farmer must be aided by suitable tools, implements or machines. The machines or

implements and tools now used must in every case be supplanted by better ones which in turn must again be supplanted. While I am ready to work for the adoption of the Wah-Wah plough, I look on it as a transition implement, something which will, after a few years, be replaced by something else. This leaves us with the problem of discussing the first objectives to be set in such a programme.

The first step in improving Indian agriculture has rightly been recognized as better ploughing. Probably the increase in yield which can be secured by better handling of the soil will equal or exceed the increase which can be secured by all other improvements taken together. That is, better manuring practice and better soil moisture control will give increases in yields which on the average will exceed the increases which can be secured from plant breeding, pest and disease control and all forms of rotation practice and other practices taken together. I would not say that such improvement in soil handling practice cannot be secured on small areas without better ploughs. There are examples of extremely high yields per acre on small areas, both by using the *deshi* plough and by using hand methods. These examples are invariably associated with appallingly high labour demands and low standards of living. I do say that any attempt to carry out a programme of extensive soil improvement, affecting the agriculture generally of any large area must be based on the use of better implements, powered by something beside human muscle.

The why of better ploughs involves the question "What is a better plough?" For Indian conditions, a better plough will have to meet two entirely different requirements, either in one or in several implements. One of these is the incorporation of organic matter into the soil, which can be related to weed control at least partially. For the farmer having only animal power, which includes the overwhelming majority of all Indian farmers now and for a considerable time at least to come, the one really practicable way of incorporating green manure and stubble is a soil-inverting plough. Fresh barnyard manure is in the same class and even compost can

probably be gotten into the soil most economically by soil inversion. During the rainy season, weeds and grasses are most effectively controlled on fallow land by soil inversion. In my opinion, therefore, any programme looking to the extensive improvement of Indian agriculture must include the introduction of a soil inverting plough.

Unfortunately, the soil-inverting plough does not meet the whole of the need at all seasons. At the end of the rainy season, especially in years when there is a long gap between the last rain and the time of seeding *rabi* crops and in areas where irrigation is not available or deficient, continued use of the soil-inverting plough loses too much moisture. some other implement, either a different bottom for the same plough or an attachment or a different implement must be used at this time. Just what that implement should be is still not clear to me. It must be a soil-stirring but not a soil-inverting implement. Similarly, some form of ploughing early in the hot weather gives profitable results, but a soil-inverting plough designed for use in moist soil takes an unnecessary amount of power, is subject to excessive wear and is difficult to handle for men and oxen. Neither inversion or pulverisation are required at this stage. The country plough is capable of doing the required type of work at the end of the rainy season but only at the expense of an appalling amount of time spent on it. Here the need is for an implement which will increase the capacity of men and bullocks at a time when work presses It is entirely incapable of doing the job required in the beginning of the hot weather.

To sum up the case for better ploughs, the soil inverting plough is necessary to make possible the better utilization of knowledge we have of better manuring practices and of weed control; the "hard ground plough is necessary to secure the desirable results of early dry weather ploughing in conserving crop residues and early rains and for spreading the work season over a larger part of the year; some soil stirring implement for killing weeds is required for use at the end of the rainy season to increase the capacity of men and bullocks,

The necessity for better ploughs is partly at least based on the possibility of improving the actual quality of the work done. In the case of other implements I propose to recommend, the need rests almost entirely on the need to increase the productive capacity of the individual. The phrase that has been used is "labour saving" which I thoroughly dislike because to most people it seems to carry the implication of unemployment. We do not—at least at this stage—wish to cause unemployment but to enable each individual to produce more.

As compared with broadcasting, some form of mechanical planting of seeds is better in that it gives better control of seed rate and more uniform placing of the seed both as to spacing and depth. I cannot at this time recommend any seed planting equipment as being ready in my opinion for general adoption, but it is needed and when available should find a place in the list of implements a progressive farmer should have. If there is any extension of the area handled with one plough, the method of planting will have to be similarly improved.

After the plough, perhaps the most urgent need for an improved machine or implement is something for harvesting and threshing. Probably the sharpest labour peak of the agricultural year is the harvest season. That is the time when every available person is fully employed and even then the work cannot be done in the required time. It was the introduction of the reaper and the mechanical thresher which really started the improvement of agriculture in the west. The problem of recommending just what should be adopted is complicated by the extremely small size of the individual holding and the smaller size of the individual field. However, better harvesting equipment will be necessary before much headway can be made. The reaper definitely is not suitable. The binder is less so. Probably India will go direct from the hand sickle to the combined harvester thresher. Small models now appearing on the market may be adapted to use with bullock draft (but with engine drive for the machine) and be used on some custom basis, that is

ownership by a contractor who will charge by area or weight of grain recovered. I do not at present see any prospect of a machine at the same time small enough to permit of individual ownership by the very small farmers and efficient enough to justify such ownership There are some things that even engineers must admit they have not yet done. To a considerable extent the harvest difficulties are tied up with the practice of making *bhusa*. If Animal Husbandry men could convince people that *bhusa* is not worth the cost as feed or if agronomists would replace it with a better fodder and use it for manure, it would greatly simplify the harvesting—threshing problem.

Scarcely less important than this is the problem of inter-culture and weed control. There seems little hope of subs tantial betterment of agricultural practice generally without planting of *kharif* crops in rows both for inter-culture and for harvesting convenience. Some form of cultivator seems an essential implement, both for inter-culture and for possible use in seed-bed preparation instead of the spring tooth harrow generally used by those practising improved methods in India. Again, I have to confess inability to make specific recommendations with definite finality. Some things seem clear now. I am satisfied that the so-called "horse hoe" supplied by American implement firms is not satisfactory, partly because it clogs too badly, partly becacse the price is too high and partly because it is rather bewildering in the choice of attachments and adjustments offered The extremely cheap "hoes" now on sale seem too *kachcha* and insecurely made to be widely used. Naturally, I feel that the Wah-Wah cultivator attachment made by us is the best thing available, or I should make something better. It seems to offer a unit which balances in power needs the small iron ploughs. It has clearance enough not to clog even in rather weedy conditions. It would be more satisfactory for inter-culture work with two handles, but that would increase the price quite a bit. Only further experience will tell whether two handles give enough additional convenience to justify their cost. Pending further development, I consider it worth recommending in its present form.

To sum up, it is definitely desirable that Indian farmers should now adopt small steel inverting ploughs and cultivators, as there are implements now available of sufficient merit to justify immediate adoption; and which will give sufficiently better results to be economically justified. There is rather urgent need for better methods of planting and of harvesting of crops in both seasons, but the implements available are hardly suitable for the needs.

The subject includes the words "and why." So far we have given little attention to the why part. It seems to me that this should be divided into two parts which are closely related. The adoption of better implements can be advocated in some cases because they make possible practices and results not possible by other methods. The best example of this is perhaps the turning under of green manure by soil-inverting ploughs, an operation nearly impossible by other means. By far the most important function of better implements, however, is the increase in the productive capacity per man by enabling each individual to accomplish more. The term "labour saving" has been widely used, but I do not like it as I do not feel that it puts the emphasis at the right place. Too many of us think "unemployment" as the answer to "labour saving."

At present the standard of living in India is low. This is not because there are too many people or because of the form of Government, nor because of the many other reasons commonly offered, but because the average production per worker is low. It has been clearly shown that the production per worker is dependent on the tools and power at the disposal of the worker. The Indian cultivator works with the poorest tools of any in the world at present. With the tools in use, there is no surplus of labour available in the villages during several seasons of the year. There are seasons when there are surplus labourers, seasonal unemployment, but there are other seasons when there are not enough labourers in most villages. The result of this scarcity of labour at some seasons combined with low production per worker at all seasons, is the necessity for the employment of women and children in field work at the busy seasons. Better implement

can and should spread out the peaks of demand for labour, partly by allowing longer seasons for some operations and partly by enabling the doing of some operations more quickly and with less labour. Rightly understood and rightly used by the cultivator, this should first result in freeing the children from the fields to go to school and the women folk for the task of making better homes. This would result not in "saving labour" but in transferring it to other uses. Any general improvement in the implements used which fails to contribute to this transfer of labour from field to home and school will fail in what I consider to be the first and most important function of better implements.

This means that those who adopt better implements should consciously plan to use them in this way. Also, while a start can be made with only one or two implements, once the start is made it will be necessary to go ahead to a complete set of implements to put the cultivation on a complete new basis before the benefits can be entirely realised.

I objected to the term 'labour saving'. I do not wish thereby to evade the question as to whether better implements will lead to unemployment or not. *If* the adoption of better implements in Indian agriculture is an isolated phenomenon with no other corresponding development, undoubtedly it will result in unemployment. *That however need not be the result.* Agriculture is responsible for the production of food, the indispensible factor in a standard of living. The function of implements is undoubtedly to enable a smaller proportion of the population to produce the necessary food for the whole. In primitive cultures, practically the whole of the population is required to produce the food needed and they have little or nothing else. Even their clothing was a by-product of food getting, skins. The introduction of simple implements enables a few individuals to be set free for production of clothing, housing and other amenities and comforts. At present the standard of food generally available is poor and capable of improvement. There are those who are under-nourished but they are mainly those who are only seasonally employed. Food production

can be and should be increased and improved in variety and better implements can contribute to that. However, greater improvement in the general standard of liv'ng can be effected by increasing the other amenities available. Housing, clothing, transportation, education and cultural opportunities, these all contribute to the standard of living as well as the food supply. It is only when the cultivator can produce a surplus of food above his own family requirements that he can feed someone else while the other man produces these other amenities and comforts. Better implements, more than all other factors taken together, will enable him to do this.

Of course, the substitution of better implements alone will not accomplish a better standard of living. Education in how to use the time set free by the women folk, a desire for schooling for the children, these things will be necessary. Industries must be established to absorb the labourers set free from agriculture as they become available. Men of vision must be found who will start and manage non-agricultural industries as well as those utilising agricultural products and they must realise that only as they share the results of improvements in production with labour, can they and labourers prosper together. America has been credited with the highest average standard of living in the world and it has been credited to her marvelous natural resources, her political institutions and to various other things. While all these things are advantages, the really important factor is that she has organised her agriculture and her industry to allow the production of the maximum output per man. This movement originated in agriculture or at least has been able to progress only as agriculture has led the way by setting progressively more men free from food production for other work.

"In all countries where cattle are important, grassland is valuable and to the question of its development and management much thought and research have been devoted and much money expended"

W. Burns,

PEANUTS AND THEIR IMPROVEMENT

By V. N. Saxena

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Introduction.—India today leads the world in the production of peanuts. The increasing demand of peanuts throughout the world offers great possibilities to the prospective producers. A large field in industries can be opened by this crop and thousands of people can be supported by it.

History.—Peanuts, also called groundnuts, are not indigenous to India, but are supposed to be native of Brazil. Six or seven species of plants closely allied to peanuts are found in Brazil in wild forms. The fact that seeds of peanuts were found in Peruvian tombs at Ancon which are supposed to be very old, indicates its antiquity in America. However, it is now cultivated practically in all hot countries, and our country tops the list in its production.

This crop was introduced in India before 1800 A. D. It has been the chief export from Pondichery to France for oil extraction since the time when Europeans first opened their trade with India. It was probably from the Phillipines that seeds were first brought over to India and cultivated in Madras from where it spread with great rapidity throughout India.

Distribution.—The total area under peanuts in India now amounts to 7,211,000 acres: Madras having by far the greatest area, *viz*: 3,427,000 acres; Bombay (including Indian States) coming next with 1,752,000 acres; Hyderabad, Mysore and C. P. and Berar stand next to Bombay in descending order in acreage and production. This indicates that this crop is primarily a South Indian crop. However, now it is grown throughout Northern India but only for local markets.

The following table gives the average acreage, production and export of peanuts according to Sir J. Russels' report.

	27-28 to 29 30		33 34 to 35-36	
	B. India	Indian Statos	B. India	Indian States
Acreage of peanuts.	4,914,000 ..	927,000 acres	4,675,000	1,917,000 acres.
Production of peanuts.	2,291,000	230,000 tons	1,954,000 ..	526,000 tons
Seed export ..	705,000 tons valued at £12,848,000.	..	490,000 tons valued at £4,803,000.	..
Oil export ..	2,370,000 galls. valued at £39,000.	..	427,000 galls. valued at £40,000.	
Cake export ..	161,000 tons valued at £1,378,000.	..	215,000 tons valued at £920,000.	

Sir John also remarks that the inadequate supply of improved seeds and lack of honest work on the part of men in-charge of distribution are the causes of low production.

Specialities :—Peanut crop is an important money crop in Southern India and fetches large profits with probably minimum investments. The capital required for the cultivation of this crop being very small, even very poor classes of farmers can grow it in no lesser way than the comparatively rich farmer. In South India it matches with cotton and is substituted for it, when the prices of cotton are low.

Botanical Description :—The peanut is a pea rather then a nut and is a member of the papilonaceae or pea family. But it differs with pea or pulses or the other legumes in that, its pod matures under ground. It is an annual, grown as *kharif* (rainy season) crop here. The plant is small and busy growing 1 to 2 ft. high and produces angular, hairy

stems with spreading branches. Some of the warieties produce branches which are comparatively long and prostrate, while those of others are short and erect. It bears small yellowish sessile flowers in the axils of leaves.

The flower buds which are enclosed in the keel, in the evening emerges out slowly and in the morning anthers pollinate the stigma. The fusion of male and female gametes is complete before the day begins to decline. The floral parts except the female part drop and wither away completely by the third day. Observations on this farm this year have shown that some of the flowers wither away completely even on the second day and the floral parts seem to have never been formed.

The stalk bearing the ovary elongates and the gynophore is visible in about 5-7 days. It grows downwards and the geotropic gynophore bearing the dormant ovary pushes down to a depth of two to five centimeters into the ground. The ovary at this stage becomes functional and begins to develop. The completion of this process requires two to three weeks after pollination depending upon the position of the flower on the stem. The process is sometimes referred to as "pegging", and after it has begun care is necessary to insure that the plant is left undisturbed which otherwise will result in the non-development of the ovary. For complete maturation of the pod, it takes about sixty days from the time of fertilization.

Being a legume, this crop is abundantly supplied with root nodules which contain the organisms or nitrogen-fixing bacteria. Ninety per cent of the nitrogen required by the plant is taken from the air by these bacteria principally by *azatobacter*.

Chemical Composition:—Peanuts are used as human food and the vegetable parts of the plants are utilized as animal feed. Both the peanuts and the plants form nutritious material. Chemical analysis shows that the plant is rich in nitrogen, sugars, as well as non-sugars; while the largest percentage of oil is found in the seeds. Peanuts furnish a good quality protein but they are deficient in

vitamins *A* and *D* and are low in calcium. Phosphorus is also not very rich in them.

The following table gives the composition of peanuts and some of its by-products in per 100 parts.

Peanuts	Water	Ash	Protein	Fibre	N-free extract	Fat or oil
Hay ..	7·83	17·04	11·75	22·11	46·95	1·84
Vines ..	6·25	6·02	13·48	29·16	36·28	15·06
Whole peanuts	6·20	4·00	36 60	24·30	21·50	7·30
Hulls ..	7·90	3·00	6·80	62·30	17·10	2·90
Cake & meal ..	7·30	5·60	46·90	9·50	22·40	8·50
Germs ..	5·60	3·10	29·10	4·50	12·00	45·40
Cotyledons ..	4·80	2·40	29·80	2·80	12·90	47·20
Skins ..	7·10	3·20	16·90	10 80	37·50	24 60
Butter ..	2·1	5	29·3	..	17·1	46·5

The shell which constitutes about 25 to 30 per cent. of the weight of pods contains appreciable quantity of potash and twice as much nitrogen as is present in ordinary farm yard manure. It is rich in lime contents.

The proteins present in the peanuts are mainly the globulins, arachin and conarachin. They are rich in aminoacid, and lysine which has been shown to be essential for the plant and animal growth. For the development of the body muscles, lysine has been found to be very necessary and is to be supplied through some food stuff because animal body can not synthesize it.

It will be discussed later on that due to such a rich composition, peanut is very useful alike to animals as well as human beings.

Economical Factors: Peanuts will adapt themselves to a wide range of climate if soil conditions are favourable. The climatic conditions preferably required by peanuts are a season of 100-140 days with moderate rainfall during the growing season, plenty of sunshine and a comparatively high temperature. In India, peanuts are grown where the average rainfall in the year is less than 40 inches. It is frequently grown under irrigation. However, fair yields have been obtained without irrigations where the annual rainfall is less than even 15 inches.

Light sandy loam soils are the most suitable kind for the production of the largest quantity of marketable peanuts to the acre. Sandy soils, other things being equal, produce the highest quality but the yields are somewhat better on the sandy loams. Dark-coloured soils stain the hulls and lower the market price. Another factor that carries importance is the drainage. A well drained soil is very benefical and most desirable.

Peanuts are particulary sensitive to water-logging, and frost causes a great damage to the crop. In India, it, being a *kharif* crop, has no danger of being affected by frosts.

Preparation of seed-bed:—The ground intended for peanuts should be ploughed several times two or three weeks before the planting. It should be thoroughly pulverized and planked to insure a good seed-bed.

In North India it is grown as a *kharif* crop only. In Madras it can be grown either as a *kharif* or a *rabi* crop; both seasons being equally suitable to it. However a larger area is sown in the *kharif* season than in the *rabi*.

Peanuts are generally sown with the beginning of rains, but can be grown in May or June under irrigation. Early sowing is preferred to late sown crops.

Method of sowing:—The methods of sowing differ in different parts of India. Commonly in this region, where small crops are grown for local consumptions, the crop is sown by hand in furrows after which immediate cowering is essential. In larger areas the seed is drilled. In Southern

Arcot the farmers still insist and find it profitable to sow by hand, while the ryots of Ceded districts of Madras generally adopt drilling and other improved methods of cultivation.

Seed rate :—The fertility of the soil is one of the factors to determine the seed rate of peanuts per care. It also differs at various places and with different varieties. The time of sowing again affects the seed rate. From the results obtained from experiments to find the best seed rate, it was found that the proper seed rate for spreading variety would be 60 lb. of kernels per acre and 80 lb. per acre for a bunch variety.

Seed:—Selection of seed is also an important factor in peanut cultivation. Generally bright clean and larger pods are prefered to the smaller ones for roasted nuts. But it does not matter when the nuts are to be used for oil extraction. The size of the peanut kernels, however depends largely on inherent qualities and not upon occasoinal large seeds. The growers can, however, select the seeds by growing them for a few years, but this is a problem for plant breeders and Government Research Farms.

Sowing :—The seeds can be sown either shelled or whole. The general practice is to use shelled seed which is more economical and gives a uniform stand to the crop. When planted whole in some places it is a practice to soak them in cold water for 12 to 24 hours before planting and then dry them one to two hours in the sun. However, the shelled seeds should never be soaked before planting. Tests made in America have shown that the peanut seeds may be kept for a period of four to five years without serious loss in germinating qualities or appreciable reduction in the size of the crop.

The rows are made at a distance of 1½ feet to 2 feet and the seeds are planted 6 to 9 inches apart. Spacing may differ in places and with time of planting, which will increase or decrease the seed rate.

Manuring:—Very commonly the peanuts are grown without any manure. Being a legume it obtains nitrogen

directly from the air. Obviously the chief fertilizer requirements of the crop are phosphate and potash.

Large quantities of nitrogen have been found to produce inferior quality of peanuts without materially increasing the yield. A series of experiments performed in India and America have shown that peanuts, unless the soil is very poor do not respond to manuring. Mostly phosphatic fertilizers and sometimes potash is recommended for peanuts. In some tracts of the Central Provinces potash has been found to increase the yield distinctly.

Lime has not been found essential on normal soils but a few experiments have shown that lime does not affect the quantity as much as quality. Better filled, whiter and larger nuts are produced by soils ordinarily richer in lime. The peanuts however require an abundance of organic matter, which should be supplied either as rotted manure or as a heavy green manure dressing to a crop preceding it.

Cultivation :—The crop does not require much of subsequent cultivation. It may be weeded once or twice till the vines occupy the land; and near the flowering time they may be earthed up to facilitate the penetration of the gynophores. An irrigation may be given if the rains cease early.

Care in Harvesting :—The nuts are usually ready to be harvested in November or December. The exact time of digging is a very important factor in the oil percentage of the nut. It should neither be a week earlier nor a week later than the proper maturing time. Complete maturity is indicated in two ways : (i) by a slight yellowing of foliage, especially at the base, and (ii) by an examination of the pods. If the peas are full grown and the inside of the shells has begun to show darkened views, it may be assumed that they are ready for harvesting.

If the crop is harvested one week earlier, it will be shown later that more than 5% of the oil is lost. On the other hand if they are left for one week after maturity there is a danger of their sprouting and thus a loss.

Harvesting:—The nuts are dug either by hand or with implements. The vines are removed by sickles and afterwards the nuts are dug. In the ceded districts of Madras an implement locally called "guntaka" is used to harvest the crop. It saves labour and time and digs most of the nuts at very low cost. Various kinds of horse-drawn machines are used to dig this crop in America. Potato diggers are generally used for this crop as well and prove to be very economical because of the high wages frequent in that country. With these machines, only 75 to 80 per cent. of the crop is harvested while about 25 per cent. is not picked up by the picker. This 25 per cent. is picked by hand in India where machines are in use and while in America hogs are let in to feed over the crop.

Cultivation in the South:--In the Madras Presidency, two district divisions can be made regarding the cultivation of peanuts. In the ceded districts the royt very much follows the American system. He sows with drills and saves a great percentage of seeds per acre; inter-cultivates the crop with bullock power and harvests the pods by his "guntaka". Later he dries and stacks the crop with the pods for 3 to 4 months until he gets leisure and threshes the crop instead of plucking the pods individually. In this way he obtains 75 per cent. of the crop at less than a sixth of the cost of the South Arcot ryot.

This mode of producing peanuts, however, is nowhere to be seen in the southern Arcot district, and the farmers will be benefited if the Government takes up the introduction of this method in this area. The producers in this area, insist on hand-shelling their produce in preference to machine decorticating. The wholesale purchasers, in order to avoid breakage of kernels, which does not fetch a good price, moisten the pods before machine-decorticating.

Besides, these kernels are rarely dried though it is not an uncommon practice to mix the hand-shelled moist seeds with them and thus increase the moisture content.

Groundnuts keep quite well in the shells for a long time but the shelled seed is easily attacked by fungus and

bacteria. A high per cent. of moisture accelerates decomposition. It is therefore necessary to exercise judicial control over the decorticating factories.

Storage:—Peanuts can be easily stored when shelled without any loss by disease or from insect pests, excepting mice, rats, squirrels, etc. A cool, dry. well-ventilated place is most suitable for storing peanuts. Small quantities may be hung in sacks from overhead supports thus offering protection from the animals stated above. Shelled peanuts, however, deteriorate very soon and fall victim to fungus and bacterial attacks. Storing in bulks before the pods are fully dry, results in their sweating or souring, thus rendering them unfit for the market or for seed. Hence, complete drying is very essential before the seeds are stored.

Yield:—Peanut yields per acre have been found to average 1000lb. in Madras as compared to the world average which is only 700lb. Under experimental conditions 1600lb. to 2000lb. of pods have been obtained in Palakuppam. More recently it has been found out that by inoculation with a special organism it is not only possible to increase the nitrogen fixation but also definitely increase the yield of the crop.

Oil formation in peanuts:—The accumulation of oil in peanuts is rather characteristic as compared with other oil-seed crops. Recent investigations and studies have shown that the oil contents increase rapidly during the early stages of the development in case of linseeds, but in case of peanuts the increase is slow, both in the interval and the final stages of the growth of the seed. It was found by Patel and Seshadri in agreement with Sahasrabuddhe and Kale that the oil is formed from carbohydrates which are converted into free fatty acids by some enzymes, and the fatty acids again are transformed into oils by other enzymes. The percentage of moisture also decreases with the development of the seed. The tables on next page illustrate the percentage of oil, fatty acid and moisture in the shell and kernels at different periods of growth of the seed.

Table No. 1.—Percentages of oil in kernels at various stages.

Stages	1	2	3	4	5	6
Number of days after flowering.	25	32	39	46	53	60
Oil in fresh kernels ..	0·35	3.58	5·87	8·35	19·75	30·94
Oil in dried kernels ..	4·27	12·31	23·48	38·28	43·86	48·51
Rate of increase per week	..	8·40	11·17	14 80	5·58	4·65

Table No. 2.—Free fatty acid content in kernels.

Stage	1	2	3	4	5	6
Number of days after flowering.	25	32	39	46	53	60
Acid value expressed as oleic acid.	51·45	26·62	14·72	9·87	6·28	5·07
Reduction in acid value per week.	..	24 83	11·90	4·85	3·59	1·21

Table No. 3.—Percentage of moisture at various stages.

Days	32	39	46	53	60
Moisture in shells	80·4	79·4	66·1	63 2	48·1
Moisture in kernels ..	76·2	75 5	65·0	53·9	33·9

The first table indicates that the synthesis of oil is most rapid for a fortnight beginning from the 32nd day after flowering, while in the periods before and after this it is rather very slow. Reduction in the fatty acid content is also uniform with the increase in oil. Also the moisture content of the seed diminishes and the shelling percentage increases as the seed developes.

Tables No. 1 and 2 confirm the point discussed under harvesting that the harvest even one week before the karnels are

fully matured will reduce the oil per cent. by 5 per cent. and increase the fatty acid content. Besides, early harvesting will increase the proportion of immature seeds which will take a longer time to dry completely, thus encouraging the chances of deterioration and fermentation because of the presence of moisture.

Properties and extraction of oil :—Groundnut oil is a non-drying oil, like olive or almond oils. It becomes turbid at 8°C, hardens at 6°C and becomes quite solid at 5°C. The specific gr. of oil at 15°C is 0·925.

The oil consists of four fatty acids, namely oleic acid, hypogaeic acid, palmatic acid and the last is similar to one found in olive oil.

The oil content in kernels differs slightly with soil and climatic environments. On an average, 48 per cent. can be taken as the oil content of a good sample, though a few varieties like Spanish and small Japan have as much as 50 per cent. of oil. Of this, 30 to 35 per cent. can be pressed out by cold pressing and 8 to 12 per cent. more after applying some heat. The second pressing yields a low grade oil. Peanut oil is extracted at Marseilles, Bordeaux and Delf from Indian and West African peanuts. Low grade oil is also largely refined and made fit for edible purposes.

Good oil is limpid, of a light colour, faint musty odour, and bland taste.

Use of oil :—Very large quantities of this oil are used for the manufacture of white Marseilles soap, margarine which is a mixture of fats and oils blended with water, milk and salt. Apart from this it is used as lubricant, illuminant, wool oiling and a substitute for olive oil. It is not hardened because the oil itself is abundantly utilized for various purposes.

Importance of peanuts and their products:—Peanuts are gaining increasing popularity day by day. Every part of the plant is used for some or other purposes. The roots form humus, and nitrogen is fixed by the nodule bacteria thus enriching the soil. The groundnut oilcake is a very

good fertilizer. The vegetative parts form every nutritive feed for cattle. F. B. Morrison, an authority on feeds and feeding of cattle, states in his book "Peanut oil meal is one of the best protein supplement for livestock feeding. This is not only due to its richness in protein and total digestible nutrients, but also because it is well liked by stock, and the protein is of especially high quality. Peanut oil meal from well-hulled nuts is fully equal to linseed meal, cottonseed meal, or soyabean oil meal in feeding value for the various classes of stock." Further he adds, "It furnishes protein of excellent quality for milk production, even slightly excelling cottonseed meal or soyabean meal in this respect in Virginia experiments."

No addition is essential to indicate the importance of peanuts as cattle feed. However, its importance does not end only here. A great number of preparations are made for human consumption in Western countries, some of which are as follows:—

1. Peanut soup.
2. " bread:
3. " pudding.
4. " rolls.
5. " putties.
6. " omelet.
7. " cream cheese.
8. " coffee.
9. " fruit roll.
10. " salad.
11. " pie crust.
12. " ice cream.
13. " butter.
14. " butter candy.
15. " cake.
16. " salted peanuts.
17. " puree of peanuts.

Recently an American Scientist made 105 preparations out of groundnuts, and five of them which he served to food specialists were highly praised. He goes on to observe "that by reason of its superior food value, the peanut product has become almost a universal diet of man; and I think I am perfectly safe in the assertion that it will not only be a prime essential in every balanced dietary but a real necessity. Indeed I do not know of any vegetable that has such a range of food utilities."

Diseases and Pests:—Peanut crop usually does not suffer from any serious disease. Only two diseases, namely "tikka" and "root rot" have been found in regions growing peanuts. The former is caused by the organism *Cercospora personata*, causing yellow spots to appear on the leaves and thereby kills the leaf tissues. The latter is caused by an organism, *Rhizoctonia destruens*. To control the 'tikka', resistant varieties may be grown or the seeds may be treated with a solution of 1lb of formaline in 40lbs. of water. Rotation is recommended for the control of root rot.

There are however several pests of peanuts, *e.g.* termites, a hairy caterpillar (*Antigastra catalaunales*), wild pigs, jackals, birds, crows, squirrels, rats, etc.—No effective control can be suggested for these but careful watching. To kill the termites, bags wetted with kerosine oil may be put in irrigation furrows

Improvement of Peanuts:—Various types of groundnuts have been from time to time introduced, but systematic attempt to improve groundnuts by breeding is of comparatively recent date and has been finally concentrated in a scheme of groundnut improvement financed by the Imperial Council of Agricultural Research and is located in Madras.

In Madras a variety called local 'Mauritius' (from Mozambique) was being grown for a long time. But it is now increasingly being replaced by a variety A. H. 25 called 'Saloum' which is drought resistant and yields about 25 per cent. more than the local variety.

Of the other varieties commonly grown in the South are Spanish or Khandesh variety, Virginia, small Japan

locally called *boria* or *red poneni*, and large Japan. In general, foreign varieties have not proved to be superior to the local or improved Indian varieties.

Inter-specific hybridisation has been carried out between *Arachis hypogea* (the commonly cultivated) and *A. Rosterirs,* two Brazilian wild species. Two varities A 10 and A.24 have been envolved from Akola for C. P., and Berar. In the United Provinces, the improved varieties are P.18, P.23, P.24. The local varieties are also fairly good.

From the foregoing discussions it is obvious that the peanuts are becoming very popular, and the world consumption is increasing by leaps and bounds. The producers of today have a vast field open before them and it is for them to make the best use of it. The utility of groundnuts is not limited to man but to animals and the plants alike. The growth of its popularity in the past has been amazing and the future is full of hopes.

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"The improvement of village life is probably the greatest need in India to-day."

SIR JOHN RUSSELL.

COTTAGE INDUSTRIES

By Mason-Vaugh

One of the most popular subjects of discussion in political and social study circles in recent years has been the question of how to revive decaying cottage industries and how to start those which have already died. Large sums have been spent by public bodies and private individuals and associations in the attempt to promote cottage industries. There has been much in the papers about it and many orations have been delivered on the beauties and desirability of an economy based on cottage industries. I have seen no presentation of the view that there may be a reason for cottage industries dying nor have I seen or heard on a public platform any expression to the effect that cottage industries cannot do all that is expected of them. We seem to have been swept away by enthusiasm to the point where we have not adequately considered the other side of this question.

I would like to start my paper by making the categorical statement that in general, cottage industries where they exist are at best a necessary evil to be permitted temporarily and that money and effort directed to reviving or encouraging them is not expended in the best interests of the people.

Before I proceed with my argument, I wish to define my terms. In this paper, the term "cottage industry" is used to refer to the manufacture for sale of products made on a small scale and with simple equipment by members of a family as a primary source of income. It does not include the manufacture of articles by employed labourers not members of the family even though the manufacture may be carried out in some part of a dwelling in which a family is living. For instance, I do not consider the Moradabad Brass industry a cottage industry. There a factory organization is broken up into small units and the work is carried on in dwellings to evade the Factory Act which regulates the conduct of factories employing more than a certain number of

people Similarly, I do not consider that spinning of thread and weaving of cloth for the use of the family is a cottage industry while the spinning of thread and weaving of cloth for sale is. Again, the keeping of chickens as part of a farmer's work is not a cottage industry but a specialized type of agriculture. I would also like to make clear the distinction between "cottage industries" and "handicrafts'. I would classify as "handicrafts" the making of small articles or simple products, primarily for use in the family but occasionally for sale where the income is not the main support of the family, and particularly where the making of these articles is occasionally, not a full time occupation.

I will list the reasons why I consider cottage industries, as defined above, something which should disappear and be replaced by something else. I shall try to arrange them somewhat in order of importance but they may not be entirely capable of such definite classification.

(1) Cottage industries are obsolete. They are a relic of the time when tools and equipment was restricted to simple hand tools and when there was no power to drive tools. As tools and equipment generally have improved, so has the advantage increased of several men working together and so dividing labour. Cottage industries were the first stage in the division of labour, in specialization in certain tasks on the part of certain individuals. In a completely self contained economy where a village or at most a small group of villages supply all their mutual needs, perhaps the cottage industry was the best that could be done. That stage is long past.

(2) The cottage industry organization poorly utilizes the abilities of people. Generally there are problems of purchase of raw materials, sale of finished products as well as of manufacture. Men differ in their ability to do these different kinds of work. Some are good managers, others are better salesmen, some purchase well. Even in the details of manufacture, in almost any product there are a variety of operations some of which are easier for certain people and others which require an entirely different type of ability. A factory type of organization where a number of men work together

allows for utilization of varying types and degrees of ability to better advantage than does single individuals working alone. The development of cottage industries was the first step in the division of labour. Advancing knowledge and equipment has now made a further development not only possible but highly desirable if we are to have the best results of the labour of the whole people.

(3) A cottage industry type of production as stated before involves very great problems of securing of raw material and of sale of finished products. These problems were not so acute in the case of village blacksmiths and carpenters using materials largely grown in the village and making things on order for next door neighbours. Use of modern equipment enables one man to produce more of one article than his next door neighbours can utilize and he wants a variety of things which his next door neighbours do not produce. If the producer has to spend his time hawking his product from door to door or sitting in a bazaar waiting for customers, his producing time and so his income is reduced. If he sells to a dealer, he is usually at the mercy of the dealer as to prices. The problem of securing raw materials is much the same.

It is easy to dismiss these difficulties as being easily solved by one or the other of two methods: government controlled "Arts and Crafts Emporiums" or co-operative societies. The government-controlled method is very likely to quickly become bureaucratic, a matter of providing employment for a number of men on fixed salaries and increments which do not depend on results secured. The success of any co-operative organization depends on finding a sufficient number of men with low pay—and men with not only ideals but business ability. It is likely that it will be no more difficult to secure such men as reasonably paid servants of some sort of factory organization.

(4) Cottage industries can rarely utilize modern equipment for production of manufactured goods. The most efficient methods of production involve succeeding processes to be carried out by specialized machines, each doing a particular operation or group of operations. Few modern products

are turned out complete in one machine. Two or more machines mean two or more operators, a larger investment, increased production and increased raw material and marketing problems. Widely available supplies of cheap electricity certainly favour the establishment of small local factories; it does little or nothing to solve the problem of cottage industries. In rare cases it may be possible for individuals to each do one or two operations on some productive process and pass the material on to another. Usually this will mean largely increased cost due to the cost of repeated transfer of material from one to another worker and to increased capital being tied up in material due to the relatively slow progress of the material through the manufacturing process. This restricts the practicable field of cottage industries to relatively simple operations done with the simplest of equipment and few operations to complete the article. In any process involving the use of several machines and complicated process, the artisan will have to invest an amount far beyond his means and employ labour, thus setting up a factory in his "cottage" or he will not be able to compete in cost with those places having such equipment, except at a lowering of his own wages.

(5) Cottage industries can rarely utilize highly trained technical skill. Generally one or two highly trained men can handle the technical problems of a number of less qualified workers so that the productive ability of the whole group is greatly increased. In the case of isolated workers the provision of this technical skill is very difficult. To some extent it can be provided by Government but at the expense of the general tax payer and even then rather inefficiently. It can rarely, if ever, be provided by the joint employment of an expert by a group of individual workers. The salary the expert can earn in other ways, is so large in proportion to the earnings of the individual workers that either the individual contribution becomes excessive or the number of contributors becomes unmanageable because of distances separating them and time lost going from one to another. Also the question of how far the individual workers are willing to submit to the advice of the technical expert, of the expert dictating

rather than advising, and if other relations between management and production are more difficult of solution in a cottage industry type of organisation than in a factory type.

(6) Perhaps the worst indictment of cottage industries system of production is that it enslaves the labourer. The history of civilization is the history of the development of tools, implements and machines. Every increase in or improvement in the tools of production available has resulted in increasing satisfaction of material wants or in increased leisure. The better the tools he works with, the easier the life of the worker. If this were not so, we would all be naked and dependent on fruits, seeds and roots we could secure for food—and we would have little or nothing else. The cottage industries artisan can produce cheaper than—or even as cheaply as the factory worker only by taking less for his labour, since that is really the only ingredient in any commodity. So-called raw materials have value only to the extent they have had labour expended on them to make them available. If less labour in a factory with machines gives the same product or if the same labour gives more product the factory labourer is better off—at least potentially. Therefore the cottage industry worker can only compete by accepting a lower wage. This lower wage makes securing a living more difficult, so not only the man but his wife and children also are pressed into the work in the effort to get enough food and clothing. Cottage industries the world over yield the lowest pay of any industrial work and the workers work longer hours and more child labour is employed than anywhere in factories. Factories in the Western countries send such work as the sewing on of buttons out to home workers only because the home workers accept less wages than factory workers. It is typical of cottage industry workers the world over that the women and children also work long hours with the men, and that the total earned is often less than that paid to the man alone in a factory—because the product is less. This evil cannot be corrected. It is inherent in the system. Factories can be and increasingly are being regulated as to hours of labour, safety of workers, accident compensation, wages and conditions or work and in other respects, and

workers in factories can combine to secure these benefits. These benefits cannot be made available to the cottage worker.

From the study of these facts, I cannot escape the conclusion that a cottage industry type of production either results in a more costly product or in a cheap product secured by the enslavement of labour. There is no other alternative. I would emphasize again that I am speaking of cottage industry as defined in the beginning of the article. I am not speaking of handicraft production of articles for personal use in leisure from regular employment where the object is recreation and the use of leisure for such activities as develop skill and ability. I personally think that handicrafts are the finest of hobbies and should be encouraged as hobbies. I also realise that they may develop into industries at times and that in the development of a new industry or occupation, there may be a stage when only one worker may be usefully employed and when the methods of production and equipment have to be hand methods and equipment. This should be only a stage, however, and generally in such cases there is no factory competition. Like childhood, this childhood of an industry, should be outgrown. There is also a place for the handicraft production of some articles as an occasional or subsidiary occupation for women in the home or by men partly employed, but the opportunity for this is largely limited to production of semi "luxury" products for a special trade. Handicrafts can rarely compete with factories in operations when power and machines can be used.

There is still and probably always will be scope for individual artisans of sufficient ability and initiative to do jobs not susceptible of factory organization These will be mainly repair jobs, the making of special types of articles of which only one or a few will be required, not enough to justify elaborate manufacturing equipment. In most cases these jobs will be best done and cheapest done in the small workshop equipped with some machine tools of a general character and employing several men of varying skill and ability. The natural thing is for such small shops to develop

in this direction. Recognition of this does not constitute an argument for encouraging the development and preservation of cottage industries.

Without reasoning out philosophically just why, artisans in general have recognized these principles. The *darzi* employs a helper as soon as he feels he has work enough for two men—or before. The blacksmith employs a "striker" to enable him to use a 10 pound hammer instead of a two or three pound one as he could working alone. So far as I know, nowhere in the world do cottage workers remain cottage workers working alone when the possibility of something increasing their productive ability is available.

What then should be our course of action? Should we actively discourage cottage workers? Should we encourage large type factories? Is there any intermediate possibility of greater value? Should we just "let nature take its course" and do nothing?

I think everyone, even the large factory owners, is aware of the difficulties of the very large factory with the concentration of large numbers of labourers in a small area and large amounts of power in the hands of a few, when the only power available was steam transmitted by shafts and belting, the large factory had a very definite advantage. With cheap electricity widely available, smaller factories can compete in costs and in many cases excell and at the same time avoid many of the labour evils associated with the big factory. No one wants to see the evils of the Western industrial systems spread in India more than they are now. I do not consider that the only alternative. Wherever cottage industries are now "thriving" I would do nothing to actively discourage them. If a study of the situation indicates that they can continue and can pay wages to correspond to factory wages, encouragement may be given. Wherever it is evident that cottage workers cannot compete with factory workers in both production and costs, I would favour active efforts to develop a type of industry which will enable them to compete or to secure employment which will give the same advantages. I am convinced that some

form of factory production will in every case give a better product and a *cheaper* product when *cost is measured in human effort.* Therefore, I would favour the concentration of money and effort available on a study of the organization of a factory type of industry which would endeavour to avoid the evils of Western factory industry on the one hand and the "sweated labour" conditions of cottage industry on the other. I believe this is possible.

It may be noted that I have said nothing about the ownership of factories. I am opposed to state socialism, government ownership, because I do not believe it will give the desired results of high production combined with the greatest freedom for the worker. Equally I see practical difficulties in attempting to organize industry on so-called co-operative lines, using the familiar types of co-operative societies. Undoubtedly the co-operative ideal of "All for one and one for all" is the ideal to work for. My observations and experience leads me to believe that the necessary combination of idealism and business efficiency can be better attained in some form of joint stock company organization with opportunity for employees to purchase stock and so participate in management than it can be in the commonly advocated form of co-operative society. I feel that there is need for further experimentation along this line and that it might well, rather I should say, should be encouraged and facilitated by government and private agencies. I am not prepared to be dogmatic as to the form of organization for the control of industry. I am fully satisfied that the cottage industry type of production cannot give the workers the benefit of their labour which can be given through some type of factory organization. If we consciously work for it, I do not see any greater difficulty about introducing idealism of a high sort into a factory organization than into any other sort of organization.

I have spoken of cottage industry above in the sense of full time occupations. I find still more difficulty with part time cottage industry as a means of earning. Part time or seasonal cottage industry has to add to the handicaps mentioned above that of each individual having to learn two

separate occupations, usually farming and an industrial occupation The periods devoted to farming serve to dull and lessen the industrial skills acquired in the shorter periods. Any implements or machinery used must be kept the whole year for only a short season's use, thus earning on the investment only for a short time. There are some seasonal industries, such as fruit and vegetable preservation. If something of this sort can be found which comes at the period of minimum agricultural activity, it is of course quite all right for idle farmers to so occupy their time. Usually this is not possible. Most of the seasonal jobs, such as cane crushing, fruit preserving, etc, come at seasons of high agricultural activity also. The farmer's income can be better and more effectively supplemented by a more diversified, better planned agricultural programme followed by part of the farmers, the others being accommodated in industry full time.

In conclusion, let us summarise. Cottage industries are typical of and suited to a primitive civilization; they are rendered obsolete by modern developments; cottage industries poorly utilize the abilities of workers, giving some too little scope for their abilities and others too much responsibility for their ability; the difficulties of raw material supply and marketing are very great; cottage industries can rarely or never utilize modern equipment and technical knowledge as can a factory organization; because of the foregoing handicaps, cottage industries can compete in most cases with factory industries only by "sweated labour" of women and children and by low wages to others The only logical conclusion therefore is that time and money put on developing cottage industries and attempting to save those now dying is likely to be wasted. While there is scope for individual artisans particularly in repair work and jobs of a non-repetitive nature, a factory organisation will give the maximum of production per worker and therefore the maximum income per worker on most kinds of industrial production.

"It will not be doubted that with reference either to individual or national welfare, agriculture is of primary importance."

GEORGE WASHINGTON.

SOME IMPORTANT CROP PLANTS

THE GEOGRAPHY OF RICE, WHEAT, SUGAR-CANE AND COTTON

By B. M. Pugh

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The field crops in this country may be classified in various ways. For instance, we may classify them according to what is generally called the scientific or botanical classification. That is, we may put various field crops into different groups which are known in Botany as families. That is, we may say for instance, that the rice plant as well as wheat, barley, maize, *juar, bajra,* oats, etc., are all grasses because botanically they belong to the so-called grass family (Gramineae). In the same way we may say that *arhar*, *mung, urd*, *masur*, *moth*, gram, peanuts and various kinds of peas and beans, belong to the faimly of legumes known as Leguminoseae. In the same way all other field crops may be classified in this way into different families.

Field crops again may be classified according to their uses, that is we may say whether a certain crop is a cereal, that is a grass whose fruit or seed is used for human consumption, or a pulse, a fibre, or fodder crop, etc This form of classification of crops is sometimes known as the economic classification of crops.

These classifications however are less known in this country. On the other hand a system of classification of crops based more or less on climate, a geographical factor, is one that is considered in this country to be the most satisfactory and hence the most popular. I refer to the fact that field crops in this country are classified into what are known as *rabi* and *kharif* crops. To be sure, this system

also is not by any means perfect, as there are a great number of crops that cannot be classified as either *rabi* or *kharif*. This distinction also does not seem to hold good in certain parts of India, for example in the South where a crop may be grown there almost throughout the year and is not therefore limited to any one period of the year, because of the little variation in climate. Again, there are certain crops that can easily respond and thus adapt themselves quickly to certain ecological factors, such as climate and soil, that they quickly produce strains or varieties that variously grow under different climates. For instance such a crop as rice can produce very great physiological changes that it can adapt itself to various soils and climate In the same way, in the Bombay Presidency, one will find two definite groups of *juars* known as the *kharif* and the *rabi juars*, hence a crop may be both *rabi* and *kharif*. Another difficulty is with crops such as sugarcane, *arhar*, *arui* and *banda*, etc., which take more than one season in order to complete their life cycle. Such is, of course, the limitation of this system also. But the system is quite popular in this province, as the *kharif* and *rabi* seasons are more clearly defined in this province than in any other province of India, except perhaps in the Punjab.

* * *

Again if we consider what we may now call the most important field crops in this country, we find that it is the geographical factors, such as climate and soil, which play a great part in making these crops as important as they are. Let me name them more or less in their order of importance: rice, wheat, sugarcane and cotton taking only four of them. These are all important crops in this country mainly because the climate and soil of this country is quite suita' le for the production of these crops.

Thus while India has an area of approximately 84 million acres under a rice crop with a total production of about 31 million tons, Japan, her next competitor, has only an area of about 8 million acres and a total production of only 11 million tons. Indo-China, the third greatest rice-producing

country in the world, has an area of about 13 million acres and a total production of nearly 6 million tons.

India has also a climate and soil which is very suitable for large scale production of wheat, and it is these two geographical factors that have made India a very serious competitor in wheat production with such countries as the United States of America, Russia and Canada. Thus our country, India, has the third largest wheat area in the world (33, 803, 000 acres in 1933-1934) although it is fourth in the amount of total production (only 9, 455, 000 tons in 1933-1934). The statistics for the other three leading wheat-producing countries of the world for 1933-1934 are as follows:—

	Area in acres.	Production in tons.
U. S. A.	57,114,000	19,976,000
Russia (U. S. S. R.) ..	85,249,000	19,929,977
Canada	27,182,000	11,868,000

If we turn to sugarcane we find that India has the greatest area of all the sugarcane producing countries of the world. The acreage in 1932 was approximately 3 million acres whereas Java, the greatest sugar-producing country in the world, has only an area of about 438,000 acres under sugarcane. However, the yield of raw sugar in India is comparatively low as the total production of raw sugar from the above acreages were 4,676,000 tons and 11,325,000 tons for India and Java respectively. In fact the yield of raw sugar in Hawaii with only 140,000 acres far exceeds that of India; the yield corresponding to this acreage being 7,633,000 tons, in 1932. Also Porto Rico with an acreage of about 256,000 acres had a yield of 5,816,000 tons of raw sugar.

Again India is one of the most important cotton-growing countries of the world. Its acreage as well as its total production is second only to that of the United States of America. The statistics for the four leading cotton-producing countries of the world are as follows:

	Area in Acres 1931-32.	Yield in bales of 400 lbs. each.
U. S. A.	38,705,000	16,252,000
India	23,722,000	5,979,000
Russia	5,367,000	1,843,000
Egypt	1,746,000	1,225,000

The point I wish to raise here is that the geographical factors have made this country one of the most important agricultural countries of the world. The immense amount of raw products obtained in this country is the result of its geographical factors which play such a very important part in crop production.

Let us now come nearer home, and confine our attention to this country and see how far geographical factors have influenced the production of these crops.

Starting again with rice, we find that this crop is grown mainly in Bengal, Madras, Bihar and Orissa, Assam and to some extent in the Terai regions of the United Provinces, in Eastern Central Provinces and in parts of the Bombay Presidency. A closer study of these regions will show that rice does well only wherever the rainfall is abundant and where the soil is heavy, that is silt loam or clay loam. The climate and soil of Bengal is particularly suitable for the production of rice. Hence it is that Bengal stands first among the rice-producing provinces of India, the acreage being approximately 25 per cent. of that of the whole Indian Empire.

In the United Provinces, rice is mostly confined to the Terai regions where again the climate and soil are similar to those we find in Bengal.

Coming next to wheat we find that the wheat area in India lies almost altogether outside the rice area. That is, it seems almost possible to divide this country approximately into two acres, the wheat area and the rice area. That is, whereas rice is grown in the south-eastern provinces wheat is grown in the north-western provinces of this country, with perhaps a line going through Allahabad as a dividing line.

It is very important to note here also that it is the geographical factors, namely climate and soil, which are responsible for this division of our country into these two areas. For, whereas rice requires a heavy soil and a moist warm climate,wheat requires a lighter type of soil, usually loam, with a cold dry climate.

It is for these reasons therefore, that wheat is mainly grown in the Punjab and the United Provinces, and in the western parts of the Central Provinces and Bihar, in Sind, Central India and the North-West Frontier Province, and in parts of the Bombay Presidency. But on the average, the Punjab and the United Provinces together have about 50 per cent. of the total area under wheat in India and produces about 61 per cent. of the total crop.

The statistics for wheat for the two leading wheat provinces of India for the year 1933-1934 are as follows :—

	Area in acrs.	Yield in tons.
Punjab	9,773,000 ..	2,794,000
United Provinces ..	8,453,000 ..	2,537,000

Leaving wheat, we now take up sugarcane. But although it was pointed out earlier that sugarcane does well in this country, as geographical factors, such as climate and soil, are very suitable for the production of sugarcane; it will be seen that as far as this country is concerned the factor of climate has not played a very important part in the present distribution of sugarcane in India. That is, sugarcane to-day in India is not being grown where the climate is usually considered as the most suitable for the growing of sugarcane. In general, the climate and area suitable for the growing of sugarcane is found in what has been termed the rice area. In the case of sugarcane however other factors, economic factors for example, have played a very important part in its present distribution in this country. Thus the greatest sugarcane growing area in this country is this province (the United Provinces) with an area of about two million acres, whereas the total acreage in the whole of India is only 4 million acres. The United Provinces, the Punjab and parts of Bihar have in spite of adverse conditions been able to grow more sugarcane than the other provinces such as Bengal, Assam and parts of the Madras and Bombay Presidencies, where the natural conditions are more congenial to the growth of sugarcane.

I now come again to cotton the fourth most important crop of India. As we study it, we find that this is perhaps

more greatly influenced by geographical factors such as climate and soil than any other crop in this country. I make this statement because the greatest acreage of cotton in this country is in what is popurlarly known as the Black Cotton soil area which extends all over Central India, t'e western part of the Central Provinces and Berar, and parts of the Bombay Presidency, Hyderabad and the Madras Presidency. To be sure a great deal of cotton is also grown in the Punjab, Sind and the United Provinces. But most of the cot'on grown in the latter three provinces is grown more or less under unnatural conditions, that is, usually under artificial irrigation. The area known as the Black Cotton Soil area is the most suitable, as the soil is retentive of moisture and as also the amount of rainfall in the area is just about sufficient to mature the crop.

It is interesting to note in this connection that the culture of cotton in the two areas is usually very difficult, and even the diseases which seriously attack the cotton crop are quite different. For, whereas the cotton wilt is the disease most prevalent in the Black Cotton Soil area it is the Root Rot of cotton which causes the greatest trouble in the alluvial soil areas of the Punjab and the United Provinces.

In general it may also be said that whereas the *arboreum* types of cotton are grown all over the Northern portion of the Black Cotton Soil area the *herbaceum* types are confined mostly to the Western coast extending from Cutch to Madras. And of the foreign types, the American cottons are now mostly grown in the Punjab and Sind and to some extent in other parts of India, and the Egyptian cotton is confined mostly to Sind.

* * * *

Another point that is of interest to students of crops as well as to students of geography is the origin of crop plants.

I shall again mention only the origins of the four crop plants that we have been considering.

Rice has been known in this country from time immemorial. Its origin seems to be South-eastern Asia,

that is the country extending from Assam and Bengal to Indo-China. More recent studies, however, seems to show that there are two groups of rices in the world: the first group is known as *Oryza sativa* type *Japonica* which is believed to be indigenous to Japan and Korea, and the second group is known as *Oryza sativa* type*Indica*, which is indigenous to India, China, Java and South-eastern Asia. Cytological evidence shows that there is some difference in the nuclear structure as well as in the sizes of the chromosomes of the two groups. It has also been found that there is some chromosomal incompatability between the two groups. Out of these two groups of rices a large number of varieties, numbering somewhere about a thousand have arisen in response to different factors which arise as a result of the environment. Thus it may be interesting to us to know that in Assam, for instance, there is a variety of rice which grows about 15 to 20 feet high, the growth always following the rise in the level of flood waters, and which has to be harvested by people from the boats.

Wheat was at one time believed to have originated in Palestine, mostly on the evidence of Aaronsohn, an American agricultural explorer, who discovered a wild wheat in that country. But more recently, the evidence found by Russian explorers, who were sent all round the world by the most reputed Russian Agricultural expert, Professor Vavilov, it has been concluded that the common soft or bread wheats originated in the region adjoining northern India, South-western Afghanistan and the southern parts of mountainous Bokhara. The origin of the hard or *durum* wheats however was probably in the region of Abyssinia. These conclusions are based on the fact that there are a great number of forms of wheat showing dominant characters in these two regions. Again it may be said that in general the soft or bread wheats are confined in this country to the alluvial soils of the Indo-Gangetic plain whereas the hard or *durum* wheats are confined to the Black Cotton Soil areas of the Bombay Deccan and the Malwa plateau.

The origin of sugarcane has not yet been definitely established. There is strong evidence, however, that the Indian

and tropical canes arose independently of each other in entirely different parts of the East. Barber was of the opinion that the Indian canes probably originated in the moister parts of India, that is in Bengal and Assam, from some plants closely related to *kans (Saccharum spontaneum)*. He also concluded, mainly on the evidence of the Australian explorers, that the tropical class of sugarcanes probably originated in some of the larger islands of Oceania, most probably in New Guinea. At any rate, the cultivation of sugarcane in India, dates back to the Hindu period, alt' ough it was probably in cultivation long before that. And from India it spread quite early into China, Arabia, and Egypt. After the Crusades it was introduced into Sicily, Portugal, the Canary Islands, and later into the New World.

One interesting point with sugarcane is that whereas cane cultivation is, as has been pointed out, in the United Provinces, the central sugarcane breeding station is located in Coimbatore in the Madras Presidency. The chief reason for this being the fact that most varieties of sugarcane will not produce flowers in this province, while they always do so at Coimbatore. And one of the interesting contributions of that station during the last few years is the hybrids of sugarcane and *kans*, hybrids of sugarcane and *juar*, and also hybrids of sugarcane and bamboo.

We now come again to cotton which has been used in this country as a fabric from time immemorial. Recent work on this crop, more especially the work of Mr. Hutchinson at Indore, has shown that there are at least three different groups of cottons, based largely on the chromosomal and genetical behaviour with different centres of origin The first group consists of the wild and cultivated cottons of the Old World with 13 chromosomes. These are the species *arboreum* and *herbaceum* of the Old Wor'd. The latter is believed to have originated in Africa, whereas *arboreum* developed in the continents of Africa and Asia. The second group includes the wild cottons of the New World with 13 chromosomes. These are indigenous to the western coast of the United States of America and Mexico. The third group is made up of the

cultivated American cottons and three wild species from islands in the Pacific with 26 chromosomes.

*   *   *   *

In conclusion I wish to point out that the study of the geography of crop plants has a very important application. From this study we know now where the greatest variation of any crop can be found. For, it follows, that the greatest variation of any crop will always be found in their centres of origin. And, wherever there is variation, a plant breeder or a plant geneticist finds the greatest opportunity for improvement. Knowing therefore that a crop has originated in any one place, we usually look to that area for new varieties of that crop, or at least for new strains that may have certain good qualities that may be combined with other qualities possessed by our local varieties. This in fact was the aim of the Russian agricultural expeditions sent by Professor Vavilov throughout the world. They were to investigate and bring back specimens of crop plants not found in their country for breeding material.

An argricultural expedition to Afganistan, with a view to get varieties of wheat which will resist rust, one of the most serious diseases of wheat will be one of the most useful projects that one can undertake at the present time.

Only about two years ago, a man was sent to Persia at the cost of the Indian Central Cotton Committee in order to find certain varieties of cotton possessing a long staple length to be crossed with the cottons of the Western coast, with a view of improving them. Although, as far as we know, the expedition has been somewhat unfruitful, new attempts, we think, ought to be made in connection with this and other crops.

"Where man's method fails and can reach no higher there God's method begins"—Ruy's broeck.

AGRICULTURAL PROBLEMS IN COCHIN STATE

By

Charles Verghese. (*Old Student.*)

The Cochin State is one of the smallest States lying in the extreme south of India. The area of the State is about 1,480 square miles with its backwaters and forests. But this State is the most densely populated in India, with a mean population of 814 per square mile. The total population of the State is about 1,205,016 according to the latest census report. In certain districts there are 2,238 persons per square mile. 43% of the total area of the State is under forest. More than 80% of the population live in rural areas. The total urban area in Cochin is 23·80 square miles and with a population of 17,195 and the mean density per square mile is about 8,637.

Cochin is purely an agricultural country. Rice is the chief product on which Cochinites live and as such, its cultivation is of primary importance at least for home consumption if not for export. Next to this, the cultivation of Coconut is the chief object of attention on account of the numerous uses to which it can be put. The net area sown is about 507,836 acres and this comes to about 53% of the total cultivable area of the State. About 67·2% of the cultivated area is under irrigation. The following is the area cultivated under each crop:—

Rice	307,434	acres	Groundnut	16,571	acres
Millets	7,699	,,	Other oil seeds	10,668	,,
Pulses	46,600	,,	Sugarcane	668	,,
Coconut	47,986	,,	Fruits, vegetables including Root-crops	74,285	,,

The total cultivable area of the State is about 582·25 square miles. The chief products of the forest are Coffee, Tea, Rubber, etc Cardomom is the most important of the minor produce of the State forests. Among other minor produce are Honey, Bees' Wax, Lemon Grass, Nuxomica and Ginger.

The flora of the State are rich in variety and luxuriance, but they have not been classified or systematically studied. The most noticeable tree is Coconut palm. In the laterite plains are seen mango, and jack in abundance. The plantain is grown in almost all the compounds attached to dwelling houses while banana is grown in patches by the fields and river banks. The soil and the climate is best suited for bananas.

A heavy rainfall, a warm humidity of the atmosphere and a uniform temperature throughout the year are the characteristic features of the climate of Cochin The rainfall is not at all heavy but fairly regular as to time and quantity. The mean rainfall is about 123 inches. The average number of rainy days during the year will be about 140. The average mean maximum temperature for the last twenty years is 87·8°F and the mean minimum 75°F and the annual mean being 81·2°F. In the latter half of February the mean temperature rises up to about 81°F, in March and in April to nearly 85°F. In the first part of May, the temperature keeps up to the average, but in the latter part the heat is moderated by frequent showers; with the beginning of June, the South-west monsoon commences. The months of June and July are characterised by heavily clouded skies, copious rainfall, frequent squalls and high humidity. It is hardly necessary to remark that in such a climate the vegetation has all the luxuriance that is commonly associated with the regions of the tropics. The strip of low plain that borders the greater part of the coast is covered with coconuts and rice fields and the villages are embowered in groves of betel nut, palms, cassia, pepper and cardomoms flourish within the jungles and form staple products for export.

Scientific and mechanical inventions have not revolutionised the agricultural industry of Cochin as has happened in other countries; nor even has there been any appreciable change in the primitive methods employed by the ancestors. The ploughman is still the hope for purposes of cultivation in spite of the advance of mechanical cultivation; the sickle and the scythe are the only means of reaping the harvests of rice; mowing is still done by the cumbersome method instead of

using the threshing machine which separates the grain from the straw much more easily; the cheap transport has not been put to advantage in reducing production costs. In short, agriculture is still in its infancy in Cochin, a country which has been the first to taste the benefits of the so-called Responsible Government.

Coconut being the most common tree grown in the sandy loam of the sea coast area, the possible industries depend upon the coconut cultivation. Every single part of the coconut from the fruit to the tree can be utilized for making bye-products. Coconut oil pressing is an important organized industry. The coastal districts of Cochin with a well distributed rain-fall and the sandy soil containing plenty of decayed vegetable matter are particularly suitable for growth of the coconut palm. The dry kernel of the nut gives an oil which is utilized for making soaps. There are about 20 oil mills at present in Cochin. The other industries carried in the State are Cotton weaving, leather industry, tile industry, coir making, soap making, pottery and match making.

Recently the Cochin Government have started a rural reconstruction centre for the rural people. As seen from the beginning of the paper 80% of the population live in the rural area, so the future of this State depends upon the rural people. The industries carried out at the centre are: Bee keeping, Cow keeping, Poultry keeping, Weaving, etc., and instructions are given to the Rural masses about agriculture and other allied subjects. Students are also being trained at the centre for a short time to make them understand about the modern methods in practical agriculture. The cultivation of secondary crops such as chillies, sugarcane, millets, root crops, etc., should be encouraged amongst the small holders. This will enable them to tide over in times when the principal crops fail due to circumstances which are beyond their control. The vast tracts of the culturable waste should be improved by the use of a suitable rotation of crops, thereby increasing the area under cultivation.

The tillage is done entirely by bullock power and about 175,000 acres are cultivated with bullock power alone. The

holding in Cochin, as in most other parts of the West-coast are generally small and scattered. So the ryots require small implements to be carried conveniently from place to place on his shoulder. Because of this reason the idea of introducing the heavy labour-saving machinery is out of the question. Consolidation of holding should be the first thing that the Government should do for the ryots and this must be done by legislature. This will save the expenses of production, time, labour, etc. The improved iron ploughs recommended by the department of agriculture are also very small. They are slightly heavier than the local plough. Because of the exorbitant price of the ploughs the ryots are not using to any extent.

The fruit industry is confined to mangoes, bananas, custard, guava, jack fruit and a few others. The mangoes and bananas can compete with any in India, and in fact in the world. The soil and the climate are best suited for these two fruits especially. It is grown very easily and widely. Little care in the infant stage, good manuring and careful grafting turn out the best trees; neither is there need of a heavy outlay. Fruits like jack, custard and bananas, etc. are used as fruits alone but canning and preservation of fruits should be encouraged by the Government so as to improve the industry.

The live-stock industry in Cochin is in a deplorable condition Mating takes place indiscriminately without due regard to progeny resulting in inferior types of animals. The number of cows, buffaloes, and goats has increased considerably during the last decade. The animals are left to wander aimlessly for grazing and due to insufficient fodder, they satisfy their hunger by raiding crops and gardens. The milk supply is utterly inadequate in spite of this increase in the number of animals. There is indeed a very real shortage in the supply of milk. An ordinary cow of the West-coast does not give more than two pounds of milk per day and the average yield of a buffalo is about four pounds. So in this respect buffalo is better than a cow for keeping. The total output of the milk in the State cannot exceed over 10,00,000 pounds for a

total population of over 12,00,000. The bulls of this part are of inferior type and they are not good for breeding purposes. The cows of this side of Malabar Coast is a worthless animal. So long as the bulls are of inferior type there is no chance of improving the cattle of the State. The Government is not taking special care to improve the cattle on the scientific principles of breeding. There are specialists in other departments of agriculture, but not in this particular industry, so the improvement of cattle is totally neglected. The cattle of this locality are practically immune from diseases though occasional outbreaks are bound to occur. Animals not required for breeding purposes should be castrated at the proper age, so as not to interfere with their subsequent development. This industry should be developed by the separate breeding of an improved strain of animals purely for milking and draught purposes. The poultry should be developed by the scientific breeding of selected pullets. All the modern and scientific methods in use should be adopted and it will be found that if proper care and good management on approved lines are done this industry will greatly add to the slender resources of the State, for it should be noted nothing be it ever so small is too small to be unimportant.

In this State exotic types of animals are getting popular. These are Schindi, Kangayam and Nellore. At present the Government have sanctioned good breeding bulls in a few places for show. But this will not lead to any appreciable improvement in this industry unless a breeding programme is followed. A sufficient number of good stud bulls of approved type and breed should be imported to replace the worthless ones if scientific breeding has to be started. After following a ten years' breeding programme, a good proportion of the present type of cattle can be replaced by better type. Private capital may not be adequate for this scheme of cattle improvement. So the Government will have to take the initiative.

The number of animals slaughtered for meat is not very large. But the slaughtered animals are either diseased or disabled. The meat of these animals are worthless and so the Government should appoint meat inspectors to test the animals before slaughtering. It is very sad to note that the Government is not taking proper steps for improving the live stock of the

State. It is surprising that a state where the latest fashions from Paris and London are in vogue amongst the smart set, where the latest fox trots and waltzes are danced to the tune of the latest pieces of music, should be so backward in the improvement and development of the Animal Husbandry which is the backbone of the State.

In order to make our produce marketable, the first essential thing is to improve the quality of the produce and when markets have been created the output must be increased in order to meet the increased demand. The most effective method of enabling the cultivator is to secure an adequate premium for superior quality produce and to have an organization for the purposes of sale and thereby avoid middleman's profits. A committee for this purpose should be appointed consisting of men of good standing, sound experience and capable of working for the welfare of the State. Solidarity is a quality seriously lacking amongst us and without this no enterprise can hope to work successfully.

NATIONAL HONEY WEEK

DURING FULL MOON IN FEBRUARY

Martandam, January 27—The Fourth National Honey Week will be celebrated in India, Burma and Ceylon during the week of February 6th to 11th.

Honey Week is celebrated each year during the week of most moonlight in February. The moon lights the paths of the villagers as they walk homeward in the night after the various programme. Martandam Y. M. C. A. Rural Reconstruction Centre as usual is planning a full educational programme of lectures, demonstrations, parades, distribution of honey, and other aids to bee-keeping.

The Martandam Staff will also assist in the setting up and conducting of Honey Week programme in several other parts of Travancore. They give advice from former experience in conducting Honey Weeks to any interested persons or organisations at any distance.

Sent from Y.M.C.A. District Office,
Travancore and Cochin,

REPORT OF THE DEPARTMENT OF AGRICULTURE, UNITED PROVINCES

FOR THE MONTH OF OCTOBER, 1938.

I—Season.—There was general rain during the first half of the month. A few districts received light showers in the third week also, but the last week was practically rainless. Taken as a whole the rainfall of the month was below the normal except in the Allahabad and Jhansi Divisions.

II—Agricultural Operations.—Harvesting of *kharif* crops is nearing completion. Preparation of land, sowing of *rabi* and picking of cotton are in progress.

III—Standing Crops and IV—Prospects of the Harvest.—The condition of standing crops is generally satisfactory and prospects favourable except in flooded areas and certain western districts where *kharif* crops have been damaged by want of rain. The outturn is estimated at 8—12 annas in the rupee. Heavy and continuous rain in the eastern districts during the monsoon has resulted in much stunting of growth of most *kharif* crops, especially fodders and millets.

V—Damage to Crops.—Crops are reported to have been heavily damaged by excessive rains and floods in eastern districts and by want of rain in the Agra Division. Sugarcane has suffered heavy loss in the eastern districts by Red Rot and flooding of fields. Fodder crops in the western districts have dried up over large areas due to drought.

VI—Agricultural Stock.—The condition of agricultural stock is generally satisfactory except in areas affected by floods. The following figures showing cattle mortality have been furnished by the Director of Veterinary Services:

Disease	September, 1938		October, 1938	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	6 030	3,282	3,143	1,762
Foot and mouth	9,898	175	7,496	58
Haemorrhagic septicaemia	3,819	2,780	1,286	1,068

The figures show distinct improvement over the last month.

VII—Pastures and Fodder.—Fodder is scarce in the areas affected by floods and also in parts of the Western districts affected by drought. It is plentiful in the central districts and Bundelkhand.

VIII—Trade and Prices—The following figures compare the average retail prices of the chief food grains in rupees per maund at the end of the month with those of the preceding month. These indicate an increase in the prices of wheat and barley and decrease in those of rice and *arhar dal*.

	End of September, 1938	End of October, 1938
Wheat	2·285	2·807
Barley	2·188	2·344
Gram	2·737	2·737
Rice	4·032	3·964
Arhar dal	4·860	4·640

IX—Health and Labour in Rural Areas.—Public health continues satisfactory. The condition of agriculturist labouring classes is generally satisfactory except in flood-affected areas.

For November, 1938

I—Season.—There were light showers in the third week of November in a few districts, the rest of the month was practically rainless.

II—Agricultural Operations.—Sowing of *rabi* and and harvesting of late rice are nearly completed. Pressing of sugarcane has commenced.

III—Standard Crops and IV—Prospects of the Harvest.—Germination of *rabi* crops has been affected on account of the absence of moisture in areas of short rainfall. The condition of standing crops is generally satisfactory and prospects favourable except in flood-affected areas. A statement showing the outturn of various *kharif* crops as reported by the district officers is enclosed.

V—Damage to Crops.—No serious damage is reported during the month.

VI Agricultural Stock.—The condition of agricultural stock is generally satisfactory. Cattle diseases have declined as indicated by the following figures of cattle mortality furnished by the Director of Veterinary Services:

	October, 1938		November, 1938	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	3,143	1,762	2,971	1,618
Foot and mouth	7,496	58	3,675	30
Haemorrhagic	1,286	1,068	580	461
Septicaemia	..	..		..

VII—Pastures and Fodder.—Fodder is generally sufficient except in the flood-affected areas and parts of the western districts which had short rainfall.

VIII—Trade and Prices.—The following figures compare the average retail prices of the chief food grains in rupees per maund at the end of the month with those of the preceding month. These indicate a general decrease in the prices of all the food grain except *arhar dal.*

	End of October, 1938	End of November, 1938
Wheat	2·807	2·690
Barley	2·344	2·103
Gram	2·737	2·711
Rice	3·964	3·673
Arhar dal	4·640	4·807

IX—Health and Labour in Rural Areas.—Public health continues satisfactory. Some cases of cholera have been reported from a few districts. The condition of the labouring and agricultural population is generally satisfactory.

'he Allahabad Farmer

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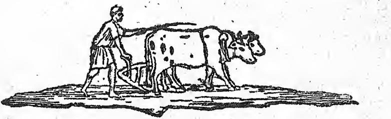

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An Editorial

The Philosophy of an Agriculturist.

Many of us who have worked with the Indian cultivator must, on many occasions, have been sorely disappointed with the results that we have achieved in our attempts to improve his lot. The failures and consequent disappointments have more often been ascribed to the conservatism of the cultivator. However, more recently we are beginning to understand as to why the Indian cultivator seems to be more conservative than some of his contemporaries of the West. The margin of profit, nay the margin between life and death, of an Indian cultivator is so small that it would take a great deal of courage on his part to experiment with new ideas, or to substitute new methods for well-tried ones which have stood the test of time throughout all these centuries that India has maintained to live. One can, therefore, very well sympathize with the Indian cultivator who seems to be averse to new ideas or new methods.

However another reason, and it seems to us a very important reason, which makes the cultivator appear incapable

of improvement is, to our minds: his attitude towards life; his philosophy of life. First of all we find in the Indian cultivator an absence of a forward or an upward look. It is true, however, that whatever ambition he had had before, that has been killed out by the unfavourable circumstances in which he is placed, so that he thinks there is no chance for improvement. It is for that reason, we believe, that the doctrine of fatalism has found a very congenial soil in the minds of our Indian cultivator. However, this must be rooted out if the urge for improvement and for better living, must come to the Indian farmer. The Indian farmer must be made to understand that diseases of men, as well as of their cattle and their crops, do not happen because it was designed that this should be so, but because these are part of nature and that man has power to control them.

Another weighty reason, which follows from the above, and which appears to us to be another impediment to much progress in our countryside, is the fact that the Indian cultivator considers himself one of the teeming millions which nature has produced in this great big world in which we live, and that he is more or less on the same level with them. The cow, the goat, the monkey, the rat, these are all God's creations made equal with man. There is a complete lack of the idea that man may be a master, nay a lord of creation How indifferent India would be if our Indian cultivator can get a glimpse of the philosophy involved in this simple statement of Jawaharlal Nehru, "I would like to command nature and conquer it rather than be slave to it". If India could take in the following command of God given to the first man, "Be fruitful and multiply, and replenish the earth, and subdue it, and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth", we are sure that a new dawn would have arisen in the rural life of India.

What is science but an attempt to understand nature and to use it for man's benefit? Nature is here to serve man Man's failure to understand nature will simply result in the extinction of the species. It is for that reason that

we believe the Indian cultivator must sooner or later understand the part that each one of God's creatures has to play in order to make man's life in this world worth living. Should we, for instance, leave the rat alone when science has shown it to be one of the greatest enemies of man? It has been estimated that the citizens of New York State pay Rs. 27,500,000 a year for damage done by rats. It would be interesting to know how many crores of rupees and how many human lives India is paying for damage done by these animals. It has been estimated again that rats have caused more deaths than all the wars of history.

The damage done to crops by birds is enormous. It must again amount to several crores of rupees every year. Yet bird control has scarcely been thought of in this country.

Other countries of the West, especially America, have sent emissaries far and wide in order to discover enemies of insect pests in their countries. Tiphia, a wasp, has been discovered to effectively control the Japanese beetle which does a great deal of damage to the fruit industry of the United States of America; tigers have been imported to Australia to control rabbits; certain lady-bird beetles have been reared as they are known to destroy aphides, a group of insects most destructive to our *rabi* crops such as wheat, mustard, barley, etc. These same beetles are also known to destroy the San Jose Scale so destructive to the apple industry in Kashmir and other parts of the world wherever apple is grown. Other countries have allowed uneconomic cattle to die out. When will our country, India, wake up to the fact that in order that man should live, his enemies should be destroyed and his friends taken care of !

The Allahabad Farmers' Fair.

The annual fair of the cultivators of the Allahabad district is being held again this year at the Allahabad Agricultural Institute from the 23rd to the 25th of February. While the fair is meant more especially for the farmers, there will be interesting exhibits for the educated public especially for those who are interested in various phases of rural reconstruction.

AGRICULTURAL IMPLEMENTS INDIA SHOULD ADOPT AND WHY

BY

MASON VAUGH

Agricultural Engineer, Allahabad Agricultural Institute.

The subject is capable of various treatments. First it would seem to limit the kinds of implements to be adopted Should this limit be permanent or should it be a sliding limit, changing with progress and passage of time? Again, the why part could be discussed from various angles, economic, social, perhaps political.

As a first principle, I think we can all agree that any change in agricultural methods and practices must be gradual. Even where the process is accelerated as much as possible, it is necessary to have five-year plans which in themselves are partial and designed to reach certain objectives within defined time limits, not to complete the process. The purpose of all implements, tools and machines is to increase the productive capacity of the individual. We now have an economy geared to the productive capacity of the population which in turn is limited by the tools with which we work. Any change in one part of this set up will mean re-adjustments elsewhere. These re-adjustments in human life require time to carry out and if they proceed too rapidly we have an Industrial Revolution with the suffering resulting from any revolution. Therefore, any plan of change in the implements and machines in use in India should be based on a gradual change over in successive stages, probably spread over several generations. A plan, however, will be better than "letting nature take its course".

If the above is accepted, changes must be gradual, continuing and probably more or less unending. Eventually they must take place in all phases of life. Restricting ourselves to agriculture, if the highest good is to be reached, every operation done by the farmer must be aided by suitable tools, implements or machines. The machines or

implements and tools now used must in every case be supplanted by better ones which in turn must again be supplanted. While I am ready to work for the adoption of the Wah-Wah plough, I look on it as a transition implement, something which will, after a few years, be replaced by something else. This leaves us with the problem of discussing the first objectives to be set in such a programme.

The first step in improving Indian agriculture has rightly been recognized as better ploughing. Probably the increase in yield which can be secured by better handling of the soil will equal or exceed the increase which can be secured by all other improvements taken together. That is, better manuring practice and better soil moisture control will give increases in yields which on the average will exceed the increases which can be secured from plant breeding, pest and disease control and all forms of rotation practice and other practices taken together. I would not say that such improvement in soil handling practice cannot be secured on small areas without better ploughs. There are examples of extremely high yields per acre on small areas, both by using the *deshi* plough and by using hand methods. These examples are invariably associated with appallingly high labour demands and low standards of living. I do say that any attempt to carry out a programme of extensive soil improvement, affecting the agriculture generally of any large area must be based on the use of better implements, powered by something beside human muscle.

The why of better ploughs involves the question "What is a better plough?" For Indian conditions, a better plough will have to meet two entirely different requirements, either in one or in several implements. One of these is the incorporation of organic matter into the soil, which can be related to weed control at least partially. For the farmer having only animal power, which includes the overwhelming majority of all Indian farmers now and for a considerable time at least to come, the one really practicable way of incorporating green manure and stubble is a soil-inverting plough. Fresh barnyard manure is in the same class and even compost can

probably be gotten into the soil most economically by soil inversion. During the rainy season, weeds and grasses are most effectively controlled on fallow land by soil inversion. In my opinion, therefore, any programme looking to the extensive improvement of Indian agriculture must include the introduction of a soil inverting plough.

Unfortunately, the soil-inverting plough does not meet the whole of the need at all seasons. At the end of the rainy season, especially in years when there is a long gap between the last rain and the time of seeding *rabi* crops and in areas where irrigation is not available or deficient, continued use of the soil-inverting plough loses too much moisture. some other implement, either a different bottom for the same plough or an attachment or a different implement must be used at this time. Just what that implement should be is still not clear to me. It must be a soil-stirring but not a soil-inverting implement. Similarly, some form of ploughing early in the hot weather gives profitable results, but a soil-inverting plough designed for use in moist soil takes an unnecessary amount of power, is subject to excessive wear and is difficult to handle for men and oxen. Neither inversion or pulverisation are required at this stage. The country plough is capable of doing the required type of work at the end of the rainy season but only at the expense of an appalling amount of time spent on it. Here the need is for an implement which will increase the capacity of men and bullocks at a time when work presses It is entirely incapable of doing the job required in the beginning of the hot weather.

To sum up the case for better ploughs, the soil inverting plough is necessary to make possible the better utilization of knowledge we have of better manuring practices and of weed control; the "hard ground plough is necessary to secure the desirable results of early dry weather ploughing in conserving crop residues and early rains and for spreading the work season over a larger part of the year; some soil stirring implement for killing weeds is required for use at the end of the rainy season to increase the capacity of men and bullocks,

The necessity for better ploughs is partly at least based on the possibility of improving the actual quality of the work done. In the case of other implements I propose to recommend, the need rests almost entirely on the need to increase the productive capacity of the individual. The phrase that has been used is "labour saving" which I thoroughly dislike because to most people it seems to carry the implication of unemployment. We do not—at least at this stage—wish to cause unemployment but to enable each individual to produce more.

As compared with broadcasting, some form of mechanical planting of seeds is better in that it gives better control of seed rate and more uniform placing of the seed both as to spacing and depth. I cannot at this time recommend any seed planting equipment as being ready in my opinion for general adoption, but it is needed and when available should find a place in the list of implements a progressive farmer should have. If there is any extension of the area handled with one plough, the method of planting will have to be similarly improved.

After the plough, perhaps the most urgent need for an improved machine or implement is something for harvesting and threshing. Probably the sharpest labour peak of the agricultural year is the harvest season. That is the time when every available person is fully employed and even then the work cannot be done in the required time. It was the introduction of the reaper and the mechanical thresher which really started the improvement of agriculture in the west. The problem of recommending just what should be adopted is complicated by the extremely small size of the individual holding and the smaller size of the individual field. However, better harvesting equipment will be necessary before much headway can be made. The reaper definitely is not suitable. The binder is less so. Probably India will go direct from the hand sickle to the combined harvester thresher. Small models now appearing on the market may be adapted to use with bullock draft (but with engine drive for the machine) and be used on some custom basis, that is

ownership by a contractor who will charge by area or weight of grain recovered. I do not at present see any prospect of a machine at the same time small enough to permit of individual ownership by the very small farmers and efficient enough to justify such ownership There are some things that even engineers must admit they have not yet done. To a considerable extent the harvest difficulties are tied up with the practice of making *bhusa*. If Animal Husbandry men could convince people that *bhusa* is not worth the cost as feed or if agronomists would replace it with a better fodder and use it for manure, it would greatly simplify the harvesting—threshing problem.

Scarcely less important than this is the problem of interculture and weed control. There seems little hope of subs tantial betterment of agricultural practice generally without planting of *kharif* crops in rows both for inter-culture and for harvesting convenience. Some form of cultivator seems an essential implement, both for inter-culture and for possible use in seed-bed preparation instead of the spring tooth harrow generally used by those practising improved methods in India. Again, I have to confess inability to make specific recommendations with definite finality. Some things seem clear now. I am satisfied that the so-called "horse hoe" supplied by American implement firms is not satisfactory, partly because it clogs too badly, partly becacse the price is too high and partly because it is rather bewildering in the choice of attachments and adjustments offered The extremely cheap "hoes" now on sale seem too *kachcha* and insecurely made to be widely used. Naturally, I feel that the Wah-Wah cultivator attachment made by us is the best thing available, or I should make something better. It seems to offer a unit which balances in power needs the small iron ploughs. It has clearance enough not to clog even in rather weedy conditions. It would be more satisfactory for interculture work with two handles, but that would increase the price quite a bit. Only further experience will tell whether two handles give enough additional convenience to justify their cost. Pending further development, I consider it worth recommending in its present form.

To sum up, it is definitely desirable that Indian farmers should now adopt small steel inverting ploughs and cultivators, as there are implements now available of sufficient merit to justify immediate adoption; and which will give sufficiently better results to be economically justified. There is rather urgent need for better methods of planting and of harvesting of crops in both seasons, but the implements available are hardly suitable for the needs.

The subject includes the words "and why." So far we have given little attention to the why part. It seems to me that this should be divided into two parts which are closely related. The adoption of better implements can be advocated in some cases because they make possible practices and results not possible by other methods. The best example of this is perhaps the turning under of green manure by soil-inverting ploughs, an operation nearly impossible by other means. By far the most important function of better implements, however, is the increase in the productive capacity per man by enabling each individual to accomplish more. The term "labour saving" has been widely used, but I do not like it as I do not feel that it puts the emphasis at the right place. Too many of us think "unemployment" as the answer to "labour saving."

At present the standard of living in India is low. This is not because there are too many people or because of the form of Government, nor because of the many other reasons commonly offered, but because the average production per worker is low. It has been clearly shown that the production per worker is dependent on the tools and power at the disposal of the worker. The Indian cultivator works with the poorest tools of any in the world at present. With the tools in use, there is no surplus of labour available in the villages during several seasons of the year. There are seasons when there are surplus labourers, seasonal unemployment, but there are other seasons when there are not enough labourers in most villages. The result of this scarcity of labour at some seasons combined with low production per worker at all seasons, is the necessity for the employment of women and children in field work at the busy seasons. Better implement

can and should spread out the peaks of demand for labour, partly by allowing longer seasons for some operations and partly by enabling the doing of some operations more quickly and with less labour. Rightly understood and rightly used by the cultivator, this should first result in freeing the children from the fields to go to school and the women folk for the task of making better homes. This would result not in "saving labour" but in transferring it to other uses. Any general improvement in the implements used which fails to contribute to this transfer of labour from field to home and school will fail in what I consider to be the first and most important function of better implements.

This means that those who adopt better implements should consciously plan to use them in this way. Also, while a start can be made with only one or two implements, once the start is made it will be necessary to go ahead to a complete set of implements to put the cultivation on a complete new basis before the benefits can be entirely realised.

I objected to the term 'labour saving'. I do not wish thereby to evade the question as to whether better implements will lead to unemployment or not. *If* the adoption of better implements in Indian agriculture is an isolated phenomenon with no other corresponding development, undoubtedly it will result in unemployment. *That however need not be the result.* Agriculture is responsible for the production of food, the indispensible factor in a standard of living. The function of implements is undoubtedly to enable a smaller proportion of the population to produce the necessary food for the whole. In primitive cultures, practically the whole of the population is required to produce the food needed and they have little or nothing else. Even their clothing was a by-product of food getting, skins. The introduction of simple implements enables a few individuals to be set free for production of clothing, housing and other amenities and comforts. At present the standard of food generally available is poor and capable of improvement. There are those who are under-nourished but they are mainly those who are only seasonally employed. Food production

can be and should be increased and improved in variety and better implements can contribute to that. However, greater improvement in the general standard of liv'ng can be effected by increasing the other amenities available. Housing, clothing, transportation, education and cultural opportunities, these all contribute to the standard of living as well as the food supply. It is only when the cultivator can produce a surplus of food above his own family requirements that he can feed someone else while the other man produces these other amenities and comforts. Better implements, more than all other factors taken together, will enable him to do this.

Of course, the substitution of better implements alone will not accomplish a better standard of living. Education in how to use the time set free by the women folk, a desire for schooling for the children, these things will be necessary. Industries must be established to absorb the labourers set free from agriculture as they become available. Men of vision must be found who will start and manage non-agricultural industries as well as those utilising agricultural products and they must realise that only as they share the results of improvements in production with labour, can they and labourers prosper together. America has been credited with the highest average standard of living in the world and it has been credited to her marvelous natural resources, her political institutions and to various other things. While all these things are advantages, the really important factor is that she has organised her agriculture and her industry to allow the production of the maximum output per man. This movement originated in agriculture or at least has been able to progress only as agriculture has led the way by setting progressively more men free from food production for other work.

"In all countries where cattle are important, grassland is valuable and to the question of its development and management much thought and research have been devoted and much money expended"

W. Burns.

PEANUTS AND THEIR IMPROVEMENT

By V. N. Saxena

B.Sc. (Ag.) Student, Allahabad Agricultural Institute.

Introduction.—India today leads the world in the production of peanuts. The increasing demand of peanuts throughout the world offers great possibilities to the prospective producers. A large field in industries can be opened by this crop and thousands of people can be supported by it.

History.—Peanuts, also called groundnuts, are not indigenous to India, but are supposed to be native of Brazil. Six or seven species of plants closely allied to peanuts are found in Brazil in wild forms. The fact that seeds of peanuts were found in Peruvian tombs at Ancon which are supposed to be very old, indicates its antiquity in America. However, it is now cultivated practically in all hot countries, and our country tops the list in its production.

This crop was introduced in India before 1800 A. D. It has been the chief export from Pondichery to France for oil extraction since the time when Europeans first opened their trade with India. It was probably from the Phillipines that seeds were first brought over to India and cultivated in Madras from where it spread with great rapidity throughout India.

Distribution.—The total area under peanuts in India now amounts to 7,211,000 acres: Madras having by far the greatest area, *viz*: 3,427,000 acres; Bombay (including Indian States) coming next with 1,752,000 acres; Hyderabad, Mysore and C. P. and Berar stand next to Bombay in descending order in acreage and production. This indicates that this crop is primarily a South Indian crop. However, now it is grown throughout Northern India but only for local markets.

The following table gives the average acreage, production and export of peanuts according to Sir J. Russels' report.

	27-28 to 29 30		33 34 to 35-36	
	B. India	Indian States	B. India	Indian States
Acreage of peanuts.	4,914,000 ..	927,000 acres	4,675,000	1,917,000 acres.
Production of peanuts.	2,291,000	230,000 tons	1,954,000 ..	526,000 tons
Seed export .	705,000 tons valued at £12,848,000.	..	490,000 tons valued at £4,803,000.	..
Oil export ..	2,370,000 galls. valued at £39,000.	..	427,000 galls. valued at £40,000.	
Cake export ..	161,000 tons valued at £1,378,000.	..	215,000 tons valued at £920,000.	

Sir John also remarks that the inadequate supply of improved seeds and lack of honest work on the part of men in-charge of distribution are the causes of low production.

Specialities :—Peanut crop is an important money crop in Southern India and fetches large profits with probably minimum investments. The capital required for the cultivation of this crop being very small, even very poor classes of farmers can grow it in no lesser way than the comparatively rich farmer. In South India it matches with cotton and is substituted for it, when the prices of cotton are low.

Botanical Description :—The peanut is a pea rather then a nut and is a member of the papilonaceae or pea family. But it differs with pea or pulses or the other legumes in that its pod matures under ground. It is an annual, grown as *kharif* (rainy season) crop here. The plant is small and busy growing 1 to 2 ft. high and produces angular, hairy

stems with spreading branches. Some of the varieties produce branches which are comparatively long and prostrate, while those of others are short and erect. It bears small yellowish sessile flowers in the axils of leaves.

The flower buds which are enclosed in the keel, in the evening emerges out slowly and in the morning anthers pollinate the stigma. The fusion of male and female gametes is complete before the day begins to decline. The floral parts except the female part drop and wither away completely by the third day. Observations on this farm this year have shown that some of the flowers wither away completely even on the second day and the floral parts seem to have never been formed.

The stalk bearing the ovary elongates and the gynophore is visible in about 5-7 days. It grows downwards and the geotropic gynophore bearing the dormant ovary pushes down to a depth of two to five centimeters into the ground. The ovary at this stage becomes functional and begins to develop. The completion of this process requires two to three weeks after pollination depending upon the position of the flower on the stem. The process is sometimes referred to as "pegging", and after it has begun care is necessary to insure that the plant is left undisturbed which otherwise will result in the non-development of the ovary. For complete maturation of the pod, it takes about sixty days from the time of fertilization.

Being a legume, this crop is abundantly supplied with root nodules which contain the organisms or nitrogen-fixing bacteria. Ninety per cent of the nitrogen required by the plant is taken from the air by these bacteria principally by *azatobacter*.

Chemical Composition:—Peanuts are used as human food and the vegetable parts of the plants are utilized as animal feed. Both the peanuts and the plants form nutritious material. Chemical analysis shows that the plant is rich in nitrogen, sugars, as well as non-sugars; while the largest percentage of oil is found in the seeds. Peanuts furnish a good quality protein but they are deficient in

vitamins *A* and *D* and are low in calcium. Phosphorus is also not very rich in them.

The following table gives the composition of peanuts and some of its by-products in per 100 parts.

Peanuts	Water	Ash	Protein	Fibre	N-free extract	Fat or oil
Hay ..	7·83	17·04	11·75	22·11	46·95	1·84
Vines ..	6·25	6·02	13·48	29·16	36·28	15·06
Whole peanuts	6·20	4·00	36 60	24·30	21·50	7·30
Hulls ..	7·90	3·00	6·80	62·30	17·10	2·90
Cake & meal ..	7·30	5·60	46·90	9·50	22·40	8·50
Germs ..	5·60	3·10	29·10	4·50	12·00	45·40
Cotyledons ..	4·80	2·40	29·80	2·80	12·90	47·20
Skins ..	7·10	3·20	16·90	10 80	37·50	24 60
Butter ..	2·1	5	29·3	..	17·1	46·5

The shell which constitutes about 25 to 30 per cent. of the weight of pods contains appreciable quantity of potash and twice as much nitrogen as is present in ordinary farm yard manure. It is rich in lime contents.

The proteins present in the peanuts are mainly the globulins, arachin and conarachin. They are rich in aminoacid, and lysine which has been shown to be essential for the plant and animal growth. For the development of the body muscles, lysine has been found to be very necessary and is to be supplied through some food stuff because animal body can not synthesize it.

It will be discussed later on that due to such a rich composition, peanut is very useful alike to animals as well as human beings.

Economical Factors : Peanuts will adapt themselves to a wide range of climate if soil conditions are favourable. The climatic conditions preferably required by peanuts are a season of 100-140 days with moderate rainfall during the growing season, plenty of sunshine and a comparatively high temperature. In India, peanuts are grown where the average rainfall in the year is less than 40 inches. It is frequently grown under irrigation. However, fair yields have been obtained without irrigations where the annual rainfall is less than even 15 inches.

Light sandy loam soils are the most suitable kind for the production of the largest quantity of marketable peanuts to the acre. Sandy soils, other things being equal, produce the highest quality but the yields are somewhat better on the sandy loams. Dark-coloured soils stain the hulls and lower the market price. Another factor that carries importance is the drainage. A well drained soil is very benefical and most desirable.

Peanuts are particulary sensitive to water-logging, and frost causes a great damage to the crop. In India, it, being a *kharif* crop, has no danger of being affected by frosts.

Preparation of seed-bed:—The ground intended for peanuts should be ploughed several times two or three weeks before the planting. It should be thoroughly pulverized and planked to insure a good seed-bed.

In North India it is grown as a *kharif* crop only. In Madras it can be grown either as a *kharif* or a *rabi* crop; both seasons being equally suitable to it. However a larger area is sown in the *kharif* season than in the *rabi*.

Peanuts are generally sown with the beginning of rains, but can be grown in May or June under irrigation. Early sowing is preferred to late sown crops.

Method of sowing :—The methods of sowing differ in different parts of India. Commonly in this region, where small crops are grown for local consumptions, the crop is sown by hand in furrows after which immediate cowering is essential. In larger areas the seed is drilled. In Southern

Arcot the farmers still insist and find it profitable to sow by hand, while the ryots of Ceded districts of Madras generally adopt drilling and other improved methods of cultivation.

Seed rate :—The fertility of the soil is one of the factors to determine the seed rate of peanuts per care. It also differs at various places and with different varieties. The time of sowing again affects the seed rate. From the results obtained from experiments to find the best seed rate, it was found that the proper seed rate for spreading variety would be 60 lb. of kernels per acre and 80 lb. per acre for a bunch variety.

Seed:—Selection of seed is also an important factor in peanut cultivation. Generally bright clean and larger pods are prefered to the smaller ones for roasted nuts. But it does not matter when the nuts are to be used for oil extraction. The size of the peanut kernels, however depends largely on inherent qualities and not upon occasoinal large seeds. The growers can, however, select the seeds by growing them for a few years, but this is a problem for plant breeders and Government Research Farms.

Sowing :—The seeds can be sown either shelled or whole. The general practice is to use shelled seed which is more economical and gives a uniform stand to the crop. When planted whole in some places it is a practice to soak them in cold water for 12 to 24 hours before planting and then dry them one to two hours in the sun. However, the shelled seeds should never be soaked before planting. Tests made in America have shown that the peanut seeds may be kept for a period of four to five years without serious loss in germinating qualities or appreciable reduction in the size of the crop.

The rows are made at a distance of 1½ feet to 2 feet and the seeds are planted 6 to 9 inches apart. Spacing may differ in places and with time of planting, which will increase or decrease the seed rate.

Manuring:—Very commonly the peanuts are grown without any manure. Being a legume it obtains nitrogen

directly from the air. Obviously the chief fertilizer requirements of the crop are phosphate and potash.

Large quantities of nitrogen have been found to produce inferior quality of peanuts without materially increasing the yield. A series of experiments performed in India and America have shown that peanuts, unless the soil is very poor do not respond to manuring. Mostly phosphatic fertilizers and sometimes potash is recommended for peanuts. In some tracts of the Central Provinces potash has been found to increase the yield distinctly.

Lime has not been found essential on normal soils but a few experiments have shown that lime does not affect the quantity as much as quality. Better filled, whiter and larger nuts are produced by soils ordinarily richer in lime. The peanuts however require an abundance of organic matter, which should be supplied either as rotted manure or as a heavy green manure dressing to a crop preceding it.

Cultivation :—The crop does not require much of subsequent cultivation. It may be weeded once or twice till the vines occupy the land; and near the flowering time they may be earthed up to facilitate the penetration of the gynophores. An irrigation may be given if the rains cease early.

Care in Harvesting :—The nuts are usually ready to be harvested in November or December. The exact time of digging is a very important factor in the oil percentage of the nut. It should neither be a week earlier nor a week later than the proper maturing time. Complete maturity is indicated in two ways : (i) by a slight yellowing of foliage, especially at the base, and (ii) by an examination of the pods. If the peas are full grown and the inside of the shells has begun to show darkened views, it may be assumed that they are ready for harvesting.

If the crop is harvested one week earlier, it will be shown later that more than 5% of the oil is lost. On the other hand if they are left for one week after maturity there is a danger of their sprouting and thus a loss.

Harvesting :—The nuts are dug either by hand or with implements. The vines are removed by sickles and afterwards the nuts are dug. In the ceded districts of Madras an implement locally called "guntaka" is used to harvest the crop. It saves labour and time and digs most of the nuts at very low cost. Various kinds of horse-drawn machines are used to dig this crop in America. Potato diggers are generally used for this crop as well and prove to be very economical because of the high wages frequent in that country. With these machines, only 75 to 80 per cent. of the crop is harvested while about 25 per cent. is not picked up by the picker. This 25 per cent. is picked by hand in India where machines are in use and while in America hogs are let in to feed over the crop.

Cultivation in the South :--In the Madras Presidency, two district divisions can be made regarding the cultivation of peanuts. In the ceded districts the royt very much follows the American system. He sows with drills and saves a great percentage of seeds per acre; inter-cultivates the crop with bullock power and harvests the pods by his "guntaka". Later he dries and stacks the crop with the pods for 3 to 4 months until he gets leisure and threshes the crop instead of plucking the pods individually. In this way he obtains 75 per cent. of the crop at less than a sixth of the cost of the South Arcot ryot.

This mode of producing peanuts, however, is nowhere to be seen in the southern Arcot district, and the farmers will be benefited if the Government takes up the introduction of this method in this area. The producers in this area, insist on hand-shelling their produce in preference to machine decorticating. The wholesale purchasers, in order to avoid breakage of kernels, which does not fetch a good price, moisten the pods before machine-decorticating.

Besides, these kernels are rarely dried though it is not an uncommon practice to mix the hand-shelled moist seeds with them and thus increase the moisture content.

Groundnuts keep quite well in the shells for a long time but the shelled seed is easily attacked by fungus and

bacteria. A high per cent. of moisture accelerates decomposition. It is therefore necessary to exercise judicial control over the decorticating factories.

Storage:—Peanuts can be easily stored when shelled without any loss by disease or from insect pests, excepting mice, rats, squirrels, etc. A cool, dry, well-ventilated place is most suitable for storing peanuts. Small quantities may be hung in sacks from overhead supports thus offering protection from the animals stated above. Shelled peanuts, however, deteriorate very soon and fall victim to fungus and bacterial attacks. Storing in bulks before the pods are fully dry, results in their sweating or souring, thus rendering them unfit for the market or for seed. Hence, complete drying is very essential before the seeds are stored.

Yield:—Peanut yields per acre have been found to average 1000lb. in Madras as compared to the world average which is only 700lb. Under experimental conditions 1600lb. to 2000lb. of pods have been obtained in Palakuppam. More recently it has been found out that by inoculation with a special organism it is not only possible to increase the nitrogen fixation but also definitely increase the yield of the crop.

Oil formation in peanuts:—The accumulation of oil in peanuts is rather characteristic as compared with other oil-seed crops. Recent investigations and studies have shown that the oil contents increase rapidly during the early stages of the development in case of linseeds, but in case of peanuts the increase is slow, both in the interval and the final stages of the growth of the seed. It was found by Patel and Seshadri in agreement with Sahasrabuddhe and Kale that the oil is formed from carbohydrates which are converted into free fatty acids by some enzymes, and the fatty acids again are transformed into oils by other enzymes. The percentage of moisture also decreases with the development of the seed. The tables on next page illustrate the percentage of oil, fatty acid and moisture in the shell and kernels at different periods of growth of the seed.

Table No. 1.—Percentages of oil in kernels at various stages.

Stages	1	2	3	4	5	6
Number of days after flowering.	25	32	39	46	53	60
Oil in fresh kernels ..	0·35	3.58	5·87	8·35	19·75	30·94
Oil in dried kernels ..	4·27	12·31	23·48	38·28	43·86	48·51
Rate of increase per week	..	8·40	11·17	14·80	5·58	4·65

Table No. 2.—Free fatty acid content in kernels.

Stage	1	2	3	4	5	6
Number of days after flowering.	25	32	39	46	53	60
Acid value expressed as oleic acid.	51·45	26·62	14·72	9·87	6·28	5·07
Reduction in acid value per week.	..	24 83	11·90	4·85	3·59	1·21

Table No. 3.—Percentage of moisture at various stages.

Days	32	39	46	53	60
Moisture in shells	80·4	79·4	66·1	63 2	48·1
Moisture in kernels ..	76·2	75 5	65·0	53·9	33·9

The first table indicates that the synthesis of oil is most rapid for a fortnight beginning from the 32nd day after flowering, while in the periods before and after this it is rather very slow. Reduction in the fatty acid content is also uniform with the increase in oil. Also the moisture content of the seed diminishes and the shelling percentage increases as the seed developes.

Tables No. 1 and 2 confirm the point discussed under harvesting that the harvest even one week before the karnels are

fully matured will reduce the oil per cent. by 5 per cent. and increase the fatty acid content. Besides, early harvesting will increase the proportion of immature seeds which will take a longer time to dry completely, thus encouraging the chances of deterioration and fermentation because of the presence of moisture.

Properties and extraction of oil :—Groundnut oil is a non-drying oil, like olive or almond oils. It becomes turbid at 8°C, hardens at 6°C and becomes quite solid at 5°C. The specific gr. of oil at 15°C is 0·925.

The oil consists of four fatty acids, namely oleic acid, hypogaeic acid, palmatic acid and the last is similar to one found in olive oil.

The oil content in kernels differs slightly with soil and climatic environments. On an average, 48 per cent. can be taken as the oil content of a good sample, though a few varieties like Spanish and small Japan have as much as 50 per cent. of oil. Of this, 30 to 35 per cent. can be pressed out by cold pressing and 8 to 12 per cent. more after applying some heat. The second pressing yields a low grade oil. Peanut oil is extracted at Marseilles, Bordeaux and Delf from Indian and West African peanuts. Low grade oil is also largely refined and made fit for edible purposes.

Good oil is limpid, of a light colour, faint musty odour, and bland taste.

Use of oil :—Very large quantities of this oil are used for the manufacture of white Marseilles soap, margarine which is a mixture of fats and oils blended with water, milk and salt. Apart from this it is used as lubricant, illuminant, wool oiling and a substitute for olive oil. It is not hardened because the oil itself is abundantly utilized for various purposes.

Importance of peanuts and their products:—Peanuts are gaining increasing popularity day by day. Every part of the plant is used for some or other purposes. The roots form humus, and nitrogen is fixed by the nodule bacteria thus enriching the soil. The groundnut oilcake is a very

good fertilizer. The vegetative parts form every nutritive feed for cattle. F. B. Morrison, an authority on feeds and feeding of cattle, states in his book "Peanut oil meal is one of the best protein supplement for livestock feeding. This is not only due to its richness in protein and total digestible nutrients, but also because it is well liked by stock, and the protein is of especially high quality. Peanut oil meal from well-hulled nuts is fully equal to linseed meal, cottonseed meal, or soyabean oil meal in feeding value for the various classes of stock." Further he adds, "It furnishes protein of excellent quality for milk production, even slightly excelling cottonseed meal or soyabean meal in this respect in Virginia experiments."

No addition is essential to indicate the importance of peanuts as cattle feed. However, its importance does not end only here. A great number of preparations are made for human consumption in Western countries, some of which are as follows :—

1. Peanut soup.
2. ,, bread:
3. ,, pudding.
4. ,, rolls.
5. ,, putties.
6. ,, omelet.
7. ,, cream cheese.
8. ,, coffee.
9. ,, fruit roll.
10. ,, salad.
11. ,, pie crust.
12. ,, ice cream.
13. ,, butter.
14. ,, butter candy.
15. ,, cake.
16. ,, salted peanuts.
17. ,, puree of peanuts.

Recently an American Scientist made 105 preparations out of groundnuts, and five of them which he served to food specialists were highly praised. He goes on to observe "that b· reason of its superior food value, the peanut product has become almost a universal diet of man; and I think I am perfectly safe in the assertion that it will not only be a prime essential in every balanced dietary but a real necessity. Indeed I do not know of any vegetable that has such a range of food utilities."

Diseases and Pests:—Peanut crop usually does not suffer from any serious disease. Only two diseases, namely "tikka" and "root rot" have been found in regions growing peanuts. The former is caused by the organism *Cercospora personata*, causing yellow spots to appear on the leaves and thereby kills the leaf tissues. The latter is caused by an organism, *Rhizoctonia destruens*. To control the 'tikka', resistant varieties may be grown or the seeds may be treated with a solution of 1lb of formaline in 40lbs. of water. Rotation is recommended for the control of root rot.

There are however several pests of peanuts, *e.g.* termites, a hairy caterpillar (*Antigastra catalaunales*), wild pigs, jackals, birds, crows, squirrels, rats, etc.—No effective control can be suggested for these but careful watching. To kill the termites, bags wetted with kerosine oil may be put in irrigation furrows

Improvement of Peanuts:—Various types of groundnuts have been from time to time introduced, but systematic attempt to improve groundnuts by breeding is of comparatively recent date and has been finally concentrated in a scheme of groundnut improvement financed by the Imperial Council of Agricultural Research and is located in Madras.

In Madras a variety called local 'Mauritius' (from Mozambique) was being grown for a long time. But it is now increasingly being replaced by a variety A. H. 25 called 'Saloum' which is drought resistant and yields about 25 per cent. more than the local variety.

Of the other varieties commonly grown in the South are Spanish or Khandesh variety, Virginia, small Japan

locally called *boria* or *red poneni,* and large Japan. In general, foreign varieties have not proved to be superior to the local or improved Indian varieties.

Inter-specific hybridisation has been carried out between *Arachis hypogea* (the commonly cultivated) and *A. Rosterirs,* two Brazilian wild species. Two varities A 10 and A.24 have been envolved from Akola for C. P., and Berar. In the United Provinces, the improved varieties are P.18, P.23, P.24. The local varieties are also fairly good.

From the foregoing discussions it is obvious that the peanuts are becoming very popular, and the world consumption is increasing by leaps and bounds. The producers of today have a vast field open before them and it is for them to make the best use of it. The utility of groundnuts is not limited to man but to animals and the plants alike. The growth of its popularity in the past has been amazing and the future is full of hopes.

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"The improvement of village life is probably the greatest need in India to-day."

SIR JOHN RUSSELL.

COTTAGE INDUSTRIES

By Mason-Vaugh

One of the most popular subjects of discussion in political and social study circles in recent years has been the question of how to revive decaying cottage industries and how to start those which have already died. Large sums have been spent by public bodies and private individuals and associations in the attempt to promote cottage industries. There has been much in the papers about it and many orations have been delivered on the beauties and desirability of an economy based on cottage industries. I have seen no presentation of the view that there may be a reason for cottage industries dying nor have I seen or heard on a public platform any expression to the effect that cottage industries cannot do all that is expected of them. We seem to have been swept away by enthusiasm to the point where we have not adequately considered the other side of this question.

I would like to start my paper by making the categorical statement that in general, cottage industries where they exist are at best a necessary evil to be permitted temporarily and that money and effort directed to reviving or encouraging them is not expended in the best interests of the people.

Before I proceed with my argument, I wish to define my terms. In this paper, the term "cottage industry" is used to refer to the manufacture for sale of products made on a small scale and with simple equipment by members of a family as a primary source of income. It does not include the manufacture of articles by employed labourers not members of the family even though the manufacture may be carried out in some part of a dwelling in which a family is living. For instance, I do not consider the Moradabad Brass industry a cottage industry. There a factory organization is broken up into small units and the work is carried on in dwellings to evade the Factory Act which regulates the conduct of factories employing more than a certain number of

people Similarly, I do not consider that spinning of thread and weaving of cloth for the use of the family is a cottage industry while the spinning of thread and weaving of cloth for sale is. Again, the keeping of chickens as part of a farmer's work is not a cottage industry but a specialized type of agriculture. I would also like to make clear the distinction between "cottage industries" and "handicrafts'. I would classify as "handicrafts" the making of small articles or simple products, primarily for use in the family but occasionally for sale where the income is not the main support of the family, and particularly where the making of these articles is occasionally, not a full time occupation.

I will list the reasons why I consider cottage industries, as defined above, something which should disappear and be replaced by something else. I shall try to arrange them somewhat in order of importance but they may not be entirely capable of such definite classification.

(1) Cottage industries are obsolete. They are a relic of the time when tools and equipment was restricted to simple hand tools and when there was no power to drive tools. As tools and equipment generally have improved, so has the advantage increased of several men working together and so dividing labour. Cottage industries were the first stage in the division of labour, in specialization in certain tasks on the part of certain individuals. In a completely self contained economy where a village or at most a small group of villages supply all their mutual needs, perhaps the cottage industry was the best that could be done. That stage is long past.

(2) The cottage industry organization poorly utilizes the abilities of people. Generally there are problems of purchase of raw materials, sale of finished products as well as of manufacture. Men differ in their ability to do these different kinds of work. Some are good managers, others are better salesmen, some purchase well. Even in the details of manufacture, in almost any product there are a variety of operations some of which are easier for certain people and others which require an entirely different type of ability. A factory type of organization where a number of men work together

allows for utilization of varying types and degrees of ability to better advantage than does single individuals working alone. The development of cottage industries was the first step in the division of labour. Advancing knowledge and equipment has now made a further development not only possible but highly desirable if we are to have the best results of the labour of the whole people.

(3) A cottage industry type of production as stated before involves very great problems of securing of raw material and of sale of finished products. These problems were not so acute in the case of village blacksmiths and carpenters using materials largely grown in the village and making things on order for next door neighbours. Use of modern equipment enables one man to produce more of one article than his next door neighbours can utilize and he wants a variety of things which his next door neighbours do not produce. If the producer has to spend his time hawking his product from door to door or sitting in a bazaar waiting for customers, his producing time and so his income is reduced. If he sells to a dealer, he is usually at the mercy of the dealer as to prices. The problem of securing raw materials is much the same.

It is easy to dismiss these difficulties as being easily solved by one or the other of two methods: government controlled "Arts and Crafts Emporiums" or co-operative societies. The government-controlled method is very likely to quickly become bureaucratic, a matter of providing employment for a number of men on fixed salaries and increments which do not depend on results secured. The success of any co-operative organization depends on finding a sufficient number of men with low pay—and men with not only ideals but business ability. It is likely that it will be no more difficult to secure such men as reasonably paid servants of some sort of factory organization.

(4) Cottage industries can rarely utilize modern equipment for production of manufactured goods. The most efficient methods of production involve succeeding processes to be carried out by specialized machines, each doing a particular operation or group of operations. Few modern products

are turned out complete in one machine. Two or more machines mean two or more operators, a larger investment, increased production and increased raw material and marketing problems. Widely available supplies of cheap electricity certainly favour the establishment of small local factories; it does little or nothing to solve the problem of cottage industries. In rare cases it may be possible for individuals to each do one or two operations on some productive process and pass the material on to another. Usually this will mean largely increased cost due to the cost of repeated transfer of material from one to another worker and to increased capital being tied up in material due to the relatively slow progress of the material through the manufacturing process. This restricts the practicable field of cottage industries to relatively simple operations done with the simplest of equipment and few operations to complete the article. In any process involving the use of several machines and complicated process, the artisan will have to invest an amount far beyond his means and employ labour, thus setting up a factory in his "cottage" or he will not be able to compete in cost with those places having such equipment, except at a lowering of his own wages.

(5) Cottage industries can rarely utilize highly trained technical skill. Generally one or two highly trained men can handle the technical problems of a number of less qualified workers so that the productive ability of the whole group is greatly increased. In the case of isolated workers the provision of this technical skill is very difficult. To some extent it can be provided by Government but at the expense of the general tax payer and even then rather inefficiently. It can rarely, if ever, be provided by the joint employment of an expert by a group of individual workers. The salary the expert can earn in other ways, is so large in proportion to the earnings of the individual workers that either the individual contribution becomes excessive or the number of contributors becomes unmanageable because of distances separating them and time lost going from one to another. Also the question of how far the individual workers are willing to submit to the advice of the technical expert, of the expert dictating

rather than advising, and if other relations between management and production are more difficult of solution in a cottage industry type of organisation than in a factory type.

(6) Perhaps the worst indictment of cottage industries system of production is that it enslaves the labourer. The history of civilization is the history of the development of tools, implements and machines. Every increase in or improvement in the tools of production available has resulted in increasing satisfaction of material wants or in increased leisure. The better the tools he works with, the easier the life of the worker. If this were not so, we would all be naked and dependent on fruits, seeds and roots we could secure for food—and we would have little or nothing else. The cottage industries artisan can produce cheaper than—or even as cheaply as the factory worker only by taking less for his labour, since that is really the only ingredient in any commodity. So-called raw materials have value only to the extent they have had labour expended on them to make them available. If less labour in a factory with machines gives the same product or if the same labour gives more product the factory labourer is better off—at least potentially. Therefore the cottage industry worker can only compete by accepting a lower wage. This lower wage makes securing a living more difficult, so not only the man but his wife and children also are pressed into the work in the effort to get enough food and clothing. Cottage industries the world over yield the lowest pay of any industrial work and the workers work longer hours and more child labour is employed than anywhere in factories. Factories in the Western countries send such work as the sewing on of buttons out to home workers only because the home workers accept less wages than factory workers. It is typical of cottage industry workers the world over that the women and children also work long hours with the men, and that the total earned is often less than that paid to the man alone in a factory—because the product is less. This evil cannot be corrected. It is inherent in the system. Factories can be and increasingly are being regulated as to hours of labour, safety of workers, accident compensation, wages and conditions or work and in other respects, and

workers in factories can combine to secure these benefits. These benefits cannot be made available to the cottage worker.

From the study of these facts, I cannot escape the conclusion that a cottage industry type of production either results in a more costly product or in a cheap product secured by the enslavement of labour. There is no other alternative. I would emphasize again that I am speaking of cottage industry as defined in the beginning of the article. I am not speaking of handicraft production of articles for personal use in leisure from regular employment where the object is recreation and the use of leisure for such activities as develop skill and ability. I personally think that handicrafts are the finest of hobbies and should be encouraged as hobbies. I also realise that they may develop into industries at times and that in the development of a new industry or occupation, there may be a stage when only one worker may be usefully employed and when the methods of production and equipment have to be hand methods and equipment. This should be only a stage, however, and generally in such cases there is no factory competition. Like childhood, this childhood of an industry, should be outgrown. There is also a place for the handicraft production of some articles as an occasional or subsidiary occupation for women in the home or by men partly employed, but the opportunity for this is largely limited to production of semi "luxury" products for a special trade. Handicrafts can rarely compete with factories in operations when power and machines can be used.

There is still and probably always will be scope for individual artisans of sufficient ability and initiative to do jobs not susceptible of factory organization These will be mainly repair jobs, the making of special types of articles of which only one or a few will be required, not enough to justify elaborate manufacturing equipment. In most cases these jobs will be best done and cheapest done in the small workshop equipped with some machine tools of a general character and employing several men of varying skill and ability. The natural thing is for such small shops to develop

in this direction. Recognition of this does not constitute an argument for encouraging the development and preservation of cottage industries.

Without reasoning out philosophically just why, artisans in general have recognized these principles. The *darzi* employs a helper as soon as he feels he has work enough for two men—or before. The blacksmith employs a "striker" to enable him to use a·10 pound hammer instead of a two or three pound one as he could working alone. So far as I know, no·where in the world do cottage workers remain cottage workers working alone when the possibility of something increasing their productive ability is available.

What then should be our course of action? Should we actively discourage cottage workers? Should we encourage large type factories? Is there any intermediate possibility of greater value? Should we just "let nature take its course" and do nothing?

I think everyone, even the large factory owners, is aware of the difficulties of the very large factory with the concentration of large numbers of labourers in a small area and large amounts of power in the hands of a few, when the only power available was steam transmitted by shafts and belting, the large factory had a very definite advantage. With cheap electricity widely available, smaller factories can compete in costs and in many cases excell and at the same time avoid many of the labour evils associated with the big factory. No one wants to see the evils of the Western industrial systems spread in India more than they are now. I do not consider that the only alternative. Wherever cottage industries are now "thriving" I would do nothing to actively discourage them. If a study of the situation indicates that they can continue and can pay wages to correspond to factory wages, encouragement may be given. Wherever it is evident that cottage workers cannot compete with factory workers in both production and costs, I would favour active efforts to develop a type of industry which will enable them to compete or to secure employment which will give the same advantages. I am convinced that some

form of factory production will in every case give a better product and a *cheaper* product when *cost is measured in human effort.* Therefore, I would favour the concentration of money and effort available on a study of the organization of a factory type of industry which would endeavour to avoid the evils of Western factory industry on the one hand and the "sweated labour" conditions of cottage industry on the other. I believe this is possible.

It may be noted that I have said nothing about the ownership of factories. I am opposed to state socialism, government ownership, because I do not believe it will give the desired results of high production combined with the greatest freedom for the worker. Equally I see practical difficulties in attempting to organize industry on so-called co-operative lines, using the familiar types of co-operative societies. Undoubtedly the co-operative ideal of "All for one and one for all" is the ideal to work for. My observations and experience leads me to believe that the necessary combination of idealism and business efficiency can be better attained in some form of joint stock company organization with opportunity for employees to purchase stock and so participate in management than it can be in the commonly advocated form of co-operative society. I feel that there is need for further experimentation along this line and that it might well, rather I should say, should be encouraged and facilitated by government and private agencies. I am not prepared to be dogmatic as to the form of organization for the control of industry. I am fully satisfied that the cottage industry type of production cannot give the workers the benefit of their labour which can be given through some type of factory organization. If we consciously work for it, I do not see any greater difficulty about introducing idealism of a high sort into a factory organization than into any other sort of organization.

I have spoken of cottage industry above in the sense of full time occupations. I find still more difficulty with part time cottage industry as a means of earning. Part time or seasonal cottage industry has to add to the handicaps mentioned above that of each individual having to learn two

separate occupations, usually farming and an industrial occupation The periods devoted to farming serve to dull and lessen the industrial skills acquired in the shorter periods. Any implements or machinery used must be kept the whole year for only a short season's use, thus earning on the investment only for a short time. There are some seasonal industries, such as fruit and vegetable preservation. If something of this sort can be found which comes at the period of minimum agricultural activity, it is of course quite all right for idle farmers to so occupy their time. Usually this is not possible. Most of the seasonal jobs, such as cane crushing, fruit preserving, etc, come at seasons of high agricultural activity also. The farmer's income can be better and more effectively supplemented by a more diversified, better planned agricultural programme followed by part of the farmers, the others being accommodated in industry full time.

In conclusion, let us summarise. Cottage industries are typical of and suited to a primitive civilization; they are rendered obsolete by modern developments; cottage industries poorly utilize the abilities of workers, giving some too little scope for their abilities and others too much responsibility for their ability; the difficulties of raw material supply and marketing are very great; cottage industries can rarely or never utilize modern equipment and technical knowledge as can a factory organization; because of the foregoing handicaps, cottage industries can compete in most cases with factory industries only by "sweated labour" of women and children and by low wages to others The only logical conclusion therefore is that time and money put on developing cottage industries and attempting to save those now dying is likely to be wasted. While there is scope for individual artisans particularly in repair work and jobs of a non-repetitive nature, a factory organisation will give the maximum of production per worker and therefore the maximum income per worker on most kinds of industrial production.

"It will not be doubted that with reference either to individual or national welfare, agriculture is of primary importance."

GEORGE WASHINGTON.

SOME IMPORTANT CROP PLANTS

THE GEOGRAPHY OF RICE, WHEAT, SUGAR-CANE AND COTTON

By B. M. Pugh

Department of Agronomy, Allahabad Agricultural Institute

The field crops in this country may be classified in various ways: For instance, we may classify them according to what is generally called the scientific or botanical classification. That is, we may put various field crops into different groups which are known in Botany as families. That is,, we may say for instance, that the rice plant as well as wheat, barley, maize, *juar, bajra,* oats, etc., are all grasses because botanically they belong to the so-called grass family (Gramineae). In the same way we may say that *arhar*, *mung, urd*, *masur*, *moth*, gram, peanuts and various kinds of peas and beans, belong to the faimly of legumes known as Leguminoseae. In the same way all other field crops may be classified in this way into different families.

Field crops again may be classified according to their uses, that is we may say whether a certain crop is a cereal, that is a grass whose fruit or seed is used for human consumption, or a pulse, a fibre, or fodder crop, etc This form of classification of crops is sometimes known as the economic classification of crops.

These classifications however are less known in this country. On the other hand a system of classification of crops based more or less on climate, a geographical factor, is one that is considered in this country to be the most satisfactory and hence the most popular. I refer to the fact that field crops in this country are classified into what are known as *rabi* and *kharif* crops. To be sure, this system

also is not by any means perfect, as there are a great number of crops that cannot be classified as either *rabi* or *kharif*. This distinction also does not seem to hold good in certain parts of India, for example in the South where a crop may be grown there almost throughout the year and is not therefore limited to any one period of the year, because of the little variation in climate. Again, there are certain crops that can easily respond and thus adapt themselves quickly to certain ecological factors, such as climate and soil, that they quickly produce strains or varieties that variously grow under different climates. For instance such a crop as rice can produce very great physiological changes that it can adapt itself to various soils and climate In the same way, in the Bombay Presidency, one will find two definite groups of *juars* known as the *kharif* and the *rabi juars*, hence a crop may be both *rabi* and *kharif*. Another difficulty is with crops such as sugarcane, *arhar*, *arui* and *banda*, etc., which take more than one season in order to complete their life cycle. Such is, of course, the limitation of this system also. But the system is quite popular in this province, as the *kharif* and *rabi* seasons are more clearly defined in this province than in any other province of India, except perhaps in the Punjab.

* * *

Again if we consider what we may now call the most important field crops in this country, we find that it is the geographical factors, such as climate and soil, which play a great part in making these crops as important as they are. Let me name them more or less in their order of importance: rice, wheat, sugarcane and cotton taking only four of them. These are all important crops in this country mainly because the climate and soil of this country is quite suitable for the production of these crops.

Thus while India has an area of approximately 84 million acres under a rice crop with a total production of about 31 million tons, Japan, her next competitor, has only an area of about 8 million acres and a total production of only 11 million tons. Indo-China, the third greatest rice-producing

country in the world, has an area of about 13 million acres and a total production of nearly 6 million tons.

India has also a climate and soil which is very suitable for large scale production of wheat, and it is these two geographical factors that have made India a very serious competitor in wheat production with such countries as the United States of America, Russia and Canada. Thus our country, India, has the third largest wheat area in the world (33, 803, 000 acres in 1933-1934) although it is fourth in the amount of total production (only 9, 455, 000 tons in 1933-1934). The statistics for the other three leading wheat-producing countries of the world for 1933-1934 are as follows:—

	Area in acres.	Production in tons.
U. S. A.	57,114,000	19,976,000
Russia (U. S. S. R.) ..	85,249,000	19,929,977
Canada	27,182,000	11,868,000

If we turn to sugarcane we find that India has the greatest area of all the sugarcane producing countries of the world. The acreage in 1932 was approximately 3 million acres whereas Java, the greatest sugar-producing country in the world, has only an area of about 438,000 acres under sugarcane. However, the yield of raw sugar in India is comparatively low as the total production of raw sugar from the above acreages were 4,676,000 tons and 11,325,000 tons for India and Java respectively. In fact the yield of raw sugar in Hawaii with only 140,000 acres far exceeds that of India; the yield corresponding to this acreage being 7,633,000 tons, in 1932. Also Porto Rico with an acreage of about 256,000 acres had a yield of 5,816,000 tons of raw sugar.

Again India is one of the most important cotton-growing countries of the world. Its acreage as well as its total production is second only to that of the United States of America. The statistics for the four leading cotton-producing countries of the world are as follows:

	Area in Acres 1931-32.	Yield in bales of 400 lbs. each.
U. S. A.	38,705,000	16,252,000
India	23,722,000	5,979,000
Russia	5,367,000	1,813,000
Egypt	1,746,000	1,225,000

The point I wish to raise here is that the geographical factors have made this country one of the most important agricultural countries of the world. The immense amount of raw products obtained in this country is the result of its geographical factors which play such a very important part in crop production.

Let us now come nearer home, and confine our attention to this country and see how far geographical factors have influenced the production of these crops.

Starting again with rice, we find that this crop is grown mainly in Bengal, Madras, Bihar and Orissa, Assam and to some extent in the Terai regions of the United Provinces, in Eastern Central Provinces and in parts of the Bombay Presidency. A closer study of these regions will show that rice does well only wherever the rainfall is abundant and where the soil is heavy, that is silt loam or clay loam. The climate and soil of Bengal is particularly suitable for the production of rice. Hence it is that Bengal stands first among the rice-producing provinces of India, the acreage being approximately 25 per cent. of that of the whole Indian ~~Empire.~~ union

In the United Provinces, rice is mostly confined to the Terai regions where again the climate and soil are similar to those we find in Bengal.

Coming next to wheat we find that the wheat area in India lies almost altogether outside the rice area. That is, it seems almost possible to divide this country approximately into two acres, the wheat area and the rice area. That is, whereas rice is grown in the south-eastern provinces wheat is grown in the north-western provinces of this country, with perhaps a line going through Allahabad as a dividing line.

It is very important to note here also that it is the geographical factors, namely climate and soil, which are responsible for this division of our country into these two areas. For, whereas rice requires a heavy soil and a moist warm climate, wheat requires a lighter type of soil, usually loam, with a cold dry climate.

It is for these reasons therefore, that wheat is mainly grown in the Punjab and the United Provinces, and in the western parts of the Central Provinces and Bihar, in Sind, Central India and the North-West Frontier Province, and in parts of the Bombay Presidency. But on the average, the Punjab and the United Provinces together have about 50 per cent. of the total area under wheat in India and produces about 61 per cent. of the total crop.

The statistics for wheat for the two leading wheat provinces of India for the year 1933-1934 are as follows :—

	Area in acrs.	Yield in tons.
Punjab	9,773,000 ..	2,794,000
United Provinces ..	8,453,000 ..	2,537,000

Leaving wheat, we now take up sugarcane. But although it was pointed out earlier that sugarcane does well in this country, as geographical factors, such as climate and soil, are very suitable for the production of sugarcane; it will be seen that as far as this country is concerned the factor of climate has not played a very important part in the present distribution of sugarcane in India. That is, sugarcane to-day in India is not being grown where the climate is usually considered as the most suitable for the growing of sugarcane. In general, the climate and area suitable for the growing of sugarcane is found in what has been termed the rice area. In the case of sugarcane however other factors, economic factors for example, have played a very important part in its present distribution in this country. Thus the greatest sugarcane-growing area in this country is this province (the United Provinces) with an area of about two million acres, whereas the total acreage in the whole of India is only 4 million acres. The United Provinces, the Punjab and parts of Bihar have in spite of adverse conditions been able to grow more sugarcane than the other provinces such as Bengal, Assam and parts of the Madras and Bombay Presidencies, where the natural conditions are more congenial to the growth of sugarcane.

I now come again to cotton the fourth most important crop of India. As we study it, we find that this is perhaps

more greatly influenced by geographical factors such as climate and soil than any other crop in this country. I make this statement because the greatest acreage of cotton in this country is in what is popurlarly known as the Black Cotton soil area which extends all over Central India, the western part of the Central Provinces and Berar, and parts of the Bombay Presidency, Hyderabad and the Madras Presidency. To be sure a great deal of cotton is also grown in the Punjab, Sind and the United Provinces. But most of the cotton grown in the latter three provinces is grown more or less under unnatural conditions, that is, usually under artificial irrigation. The area known as the Black Cotton Soil area is the most suitable, as the soil is retentive of moisture and as also the amount of rainfall in the area is just about sufficient to mature the crop.

It is interesting to note in this connection that the culture of cotton in the two areas is usually very difficult, and even the diseases which seriously attack the cotton crop are quite different. For, whereas the cotton wilt is the disease most prevalent in the Black Cotton Soil area it is the Root Rot of cotton which causes the greatest trouble in the alluvial soil areas of the Punjab and the United Provinces.

In general it may also be said that whereas the *arboreum* types of cotton are grown all over the Northern portion of the Black Cotton Soil area the *herbaceum* types are confined mostly to the Western coast extending from Cutch to Madras. And of the foreign types, the American cottons are now mostly grown in the Punjab and Sind and to some extent in other parts of India, and the Egyptian cotton is confined mostly to Sind.

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Another point that is of interest to students of crops as well as to students of geography is the origin of crop plants.

I shall again mention only the origins of the four crop plants that we have been considering.

Rice has been known in this country from time immemorial. Its origin seems to be South-eastern Asia,

that is the country extending from Assam and Bengal to Indo-China. More recent studies, however, seems to show that there are two groups of rices in the world: the first group is known as *Oryza sativa* type *Japonica* which is believed to be indigenous to Japan and Korea, and the second group is known as *Oryza sativa* type*Indica*, which is indigenous to India, China, Java and South-eastern Asia. Cytological evidence shows that there is some difference in the nuclear structure as well as in the sizes of the chromosomes of the two groups. It has also been found that there is some chromosomal incompatability between the two groups. Out of these two groups of rices a large number of varieties, numbering somewhere about a thousand have arisen in response to different factors which arise as a result of the environment. Thus it may be interesting to us to know that in Assam, for instance, there is a variety of rice which grows about 15 to 20 feet high, the growth always following the rise in the level of flood waters, and which has to be harvested by people from the boats.

Wheat was at one time believed to have originated in Palestine, mostly on the evidence of Aaronsohn, an American agricultural explorer, who discovered a wild wheat in that country. But more recently, the evidence found by Russian explorers, who were sent all round the world by the most reputed Russian Agricultural expert, Professor Vavilov, it has been concluded that the common soft or bread wheats originated in the region adjoining northern India, South-western Afghanistan and the southern parts of mountainous Bokhara. The origin of the hard or *durum* wheats however was probably in the region of Abyssinia. These conclusions are based on the fact that there are a great number of forms of wheat showing dominant characters in these two regions. Again it may be said that in general the soft or bread wheats are confined in this country to the alluvial soils of the Indo-Gangetic plain whereas the hard or *durum* wheats are confined to the Black Cotton Soil areas of the Bombay Deccan and the Malwa plateau.

The origin of sugarcane has not yet been definitely established. There is strong evidence, however, that the Indian

and tropical canes arose independently of each other in entirely different parts of the East. Barber was of the opinion that the Indian canes probably originated in the moister parts of India, that is in Bengal and Assam, from some plants closely related to *kans (Saccharum spontaneum)*. He also concluded, mainly on the evidence of the Australian explorers, that the tropical class of sugarcanes probably originated in some of the larger islands of Oceania, most probably in New Guinea. At any rate, the cultivation of sugarcane in India, dates back to the Hindu period, alt'ough it was probably in cultivation long before that. And from India it spread quite early into China, Arabia, and Egypt. After the Crusades it was introduced into Sicily, Portugal, the Canary Islands, and later into the New World.

One interesting point with sugarcane is that whereas cane cultivation is, as has been pointed out, in the United Provinces, the central sugarcane breeding station is located in Coimbatore in the Madras Presidency. The chief reason for this being the fact that most varieties of sugarcane will not produce flowers in this province, while they always do so at Coimbatore. And one of the interesting contributions of that station during the last few years is the hybrids of sugarcane and *kans*, hybrids of sugarcane and *juar*, and also hybrids of sugarcane and bamboo.

We now come again to cotton which has been used in this country as a fabric from time immemorial. Recent work on this crop, more especially the work of Mr. Hutchinson at Indore, has shown that there are at least three different groups of cottons, based largely on the chromosomal and genetical behaviour with different centres of origin The first group consists of the wild and cultivated cottons of the Old World with 13 chromosomes. These are the species *arboreum* and *herbaceum* of the Old World. The latter is believed to have originated in Africa, whereas *arboreum* developed in the continents of Africa and Asia. The second group includes the wild cottons of the New World with 13 chromosomes. These are indigenous to the western coast of the United States of America and Mexico. The third group is made up of the

cultivated American cottons and three wild species from islands in the Pacific with 26 chromosomes.

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In conclusion I wish to point out that the study of the geography of crop plants has a very important application. From this study we know now where the greatest variation of any crop can be found. For, it follows, that the greatest variation of any crop will always be found in their centres of origin. And, wherever there is variation, a plant breeder or a plant geneticist finds the greatest opportunity for improvement. Knowing therefore that a crop has originated in any one place, we usually look to that area for new varieties of that crop, or at least for new strains that may have certain good qualities that may be combined with other qualities possessed by our local varieties. This in fact was the aim of the Russian agricultural expeditions sent by Professor Vavilov throughout the world. They were to investigate and bring back specimens of crop plants not found in their country for breeding material.

An argricultural expedition to Afganistan, with a view to get varieties of wheat which will resist rust, one of the most serious diseases of wheat will be one of the most useful projects that one can undertake at the present time.

Only about two years ago, a man was sent to Persia at the cost of the Indian Central Cotton Committee in order to find certain varieties of cotton possessing a long staple length to be crossed with the cottons of the Western coast, with a view of improving them. Although, as far as we know, the expedition has been somewhat unfruitful, new attempts, we think, ought to be made in connection with this and other crops.

"Where man's method fails and can reach no higher there God's method begins"—Ruy's broeck.

AGRICULTURAL PROBLEMS IN COCHIN STATE

By

CHARLES VERGHESE. (*Old Student.*)

The Cochin State is one of the smallest States lying in the extreme south of India. The area of the State is about 1,480 square miles with its backwaters and forests. But this State is the most densely populated in India, with a mean population of 814 per square mile. The total population of the State is about 1,205,016 according to the latest census report. In certain districts there are 2,238 persons per square mile. 43% of the total area of the State is under forest. More than 80% of the population live in rural areas. The total urban area in Cochin is 23·80 square miles and with a population of 17,195 and the mean density per square mile is about 8,637.

Cochin is purely an agricultural country. Rice is the chief product on which Cochinites live and as such, its cultivation is of primary importance at least for home consumption if not for export. Next to this, the cultivation of Coconut is the chief object of attention on account of the numerous uses to which it can be put. The net area sown is about 507,836 acres and this comes to about 53% of the total cultivable area of the State. About 67·2% of the cultivated area is under irrigation. The following is the area cultivated under each crop:—

Rice	307,434 acres	Groundnut	16,571 acres
Millets	7,699 ,,	Other oil seeds	10,668 ,,
Pulses	46,600 ,,	Sugarcane	668 ,,
Coconut	47,986 ,,	Fruits, vegetables including Root-crops	74,285 ,,

The total cultivable area of the State is about 582·25 square miles. The chief products of the forest are Coffee, Tea, Rubber, etc Cardomom is the most important of the minor produce of the State forests. Among other minor produce are Honey, Bees' Wax, Lemon Grass, Nuxomica and Ginger.

The flora of the State are rich in variety and luxuriance, but they have not been classified or systematically studied. The most noticeable tree is Coconut palm. In the laterite plains are seen mango, and jack in abundance. The plantain is grown in almost all the compounds attached to dwelling houses while banana is grown in patches by the fields and river banks. The soil and the climate is best suited for bananas.

A heavy rainfall, a warm humidity of the atmosphere and a uniform temperature throughout the year are the characteristic features of the climate of Cochin The rainfall is not at all heavy but fairly regular as to time and quantity. The mean rainfall is about 123 inches. The average number of rainy days during the year will be about 140. The average mean maximum temperature for the last twenty years is 87·8°F and the mean minimum 75°F and the annual mean being 81·2°F. In the latter half of February the mean temperature rises up to about 81°F, in March and in April to nearly 85°F. In the first part of May, the temperature keeps up to the average, but in the latter part the heat is moderated by frequent showers; with the beginning of June, the South-west monsoon commences.. The months of June and July are characterised by heavily clouded skies, copious rainfall, frequent squalls and high humidity. It is hardly necessary to remark that in such a climate the vegetation has all the luxuriance that is commonly associated with the regions of the tropics. The strip of low plain that borders the greater part of the coast is covered with coconuts and rice fields and the villages are embowered in groves of betel nut, palms, cassia, pepper and cardomoms flourish within the jungles and form staple products for export.

Scientific and mechanical inventions have not revolutionised the agricultural industry of Cochin as has happened in other countries; nor even has there been any appreciable change in the primitive methods employed by the ancestors. The ploughman is still the hope for purposes of cultivation in spite of the advance of mechanical cultivation; the sickle and the scythe are the only means of reaping the harvests of rice; mowing is still done by the cumbersome method instead of

using the threshing machine which separates the grain from the straw much more easily; the cheap transport has not been put to advantage in reducing production costs. In short, agriculture is still in its infancy in Cochin, a country which has been the first to taste the benefits of the so-called Responsible Government.

Coconut being the most common tree grown in the sandy loam of the sea coast area, the possible industries depend upon the coconut cultivation. Every single part of the coconut from the fruit to the tree can be utilized for making bye-products. Coconut oil pressing is an important organized industry. The coastal districts of Cochin with a well distributed rain-fall and the sandy soil containing plenty of decayed vegetable matter are particularly suitable for growth of the coconut palm. The dry kernel of the nut gives an oil which is utilized for making soaps. There are about 20 oil mills at present in Cochin. The other industries carried in the State are Cotton weaving, leather industry, tile industry, coir making, soap making, pottery and match making.

Recently the Cochin Government have started a rural reconstruction centre for the rural people. As seen from the beginning of the paper 80% of the population live in the rural area, so the future of this State depends upon the rural people. The industries carried out at the centre are: Bee keeping, Cow keeping, Poultry keeping, Weaving, etc., and instructions are given to the Rural masses about agriculture and other allied subjects. Students are also being trained at the centre for a short time to make them understand about the modern methods in practical agriculture. The cultivation of secondary crops such as chillies, sugarcane, millets, root crops, etc., should be encouraged amongst the small holders. This will enable them to tide over in times when the principal crops fail due to circumstances which are beyond their control. The vast tracts of the culturable waste should be improved by the use of a suitable rotation of crops, thereby increasing the area under cultivation.

The tillage is done entirely by bullock power and about 175,000 acres are cultivated with bullock power alone. The

holding in Cochin, as in most other parts of the West-coast are generally small and scattered. So the ryots require small implements to be carried conveniently from place to place on his shoulder. Because of this reason the idea of introducing the heavy labour-saving machinery is out of the question. Consolidation of holding should be the first thing that the Government should do for the ryots and this must be done by legislature. This will save the expenses of production, time, labour, etc. The improved iron ploughs recommended by the department of agriculture are also very small. They are slightly heavier than the local plough. Because of the exorbitant price of the ploughs the ryots are not using to any extent.

The fruit industry is confined to mangoes, bananas, custard, guava, jack fruit and a few others. The mangoes and bananas can compete with any in India, and in fact in the world. The soil and the climate are best suited for these two fruits especially. It is grown very easily and widely. Little care in the infant stage, good manuring and careful grafting turn out the best trees; neither is there need of a heavy outlay. Fruits like jack, custard and bananas, etc. are used as fruits alone but canning and preservation of fruits should be encouraged by the Government so as to improve the industry.

The live-stock industry in Cochin is in a deplorable condition Mating takes place indiscriminately without due regard to progeny resulting in inferior types of animals. The number of cows, buffaloes, and goats has increased considerably during the last decade. The animals are left to wander aimlessly for grazing and due to insufficient fodder, they satisfy their hunger by raiding crops and gardens. The milk supply is utterly inadequate in spite of this increase in the number of animals. There is indeed a very real shortage in the supply of milk. An ordinary cow of the West-coast does not give more than two pounds of milk per day and the average yield of a buffalo is about four pounds. So in this respect buffalo is better than a cow for keeping. The total output of the milk in the State cannot exceed over 10,00,000 pounds for a

total population of over 12,00,000. The bulls of this part are of inferior type and they are not good for breeding purposes. The cows of this side of Malabar Coast is a worthless animal. So long as the bulls are of inferior type there is no chance of improving the cattle of the State. The Government is not taking special care to improve the cattle on the scientific principles of breeding. There are specialists in other departments of agriculture, but not in this particular industry, so the improvement of cattle is totally neglected. The cattle of this locality are practically immune from diseases though occasional outbreaks are bound to occur. Animals not required for breeding purposes should be castrated at the proper age, so as not to interfere with their subsequent development. This industry should be developed by the separate breeding of an improved strain of animals purely for milking and draught purposes. The poultry should be developed by the scientific breeding of selected pullets. All the modern and scientific methods in use should be adopted and it will be found that if proper care and good management on approved lines are done this industry will greatly add to the slender resources of the State, for it should be noted nothing be it ever so small is too small to be unimportant.

In this State exotic types of animals are getting popular. These are Schindi, Kangayam and Nellore. At present the Government have sanctioned good breeding bulls in a few places for show. But this will not lead to any appreciable improvement in this industry unless a breeding programme is followed. A sufficient number of good stud bulls of approved type and breed should be imported to replace the worthless ones if scientific breeding has to be started. After following a ten years' breeding programme, a good proportion of the present type of cattle can be replaced by better type. Private capital may not be adequate for this scheme of cattle improvement. So the Government will have to take the initiative.

The number of animals slaughtered for meat is not very large. But the slaughtered animals are either diseased or disabled. The meat of these animals are worthless and so the Government should appoint meat inspectors to test the animals before slaughtering. It is very sad to note that the Government is not taking proper steps for improving the live stock of the

State. It is surprising that a state where the latest fashions from Paris and London are in vogue amongst the smart set, where the latest fox trots and waltzes are danced to the tune of the latest pieces of music, should be so backward in the improvement and development of the Animal Husbandry which is the backbone of the State.

In order to make our produce marketable, the first essential thing is to improve the quality of the produce and when markets have been created the output must be increased in order to meet the increased demand. The most effective method of enabling the cultivator is to secure an adequate premium for superior quality produce and to have an organization for the purposes of sale and thereby avoid middleman's profits. A committee for this purpose should be appointed consisting of men of good standing, sound experience and capable of working for the welfare of the State. Solidarity is a quality seriously lacking amongst us and without this no enterprise can hope to work successfully.

NATIONAL HONEY WEEK

DURING FULL MOON IN FEBRUARY

Martandam, January 27—The Fourth National Honey Week will be celebrated in India, Burma and Ceylon during the week of February 6th to 11th.

Honey Week is celebrated each year during the week of most moonlight in February. The moon lights the paths of the villagers as they walk homeward in the night after the various programme. Martandam Y. M. C. A. Rural Reconstruction Centre as usual is planning a full educational programme of lectures, demonstrations, parades, distribution of honey, and other aids to bee-keeping.

The Martandam Staff will also assist in the setting up and conducting of Honey Week programme in several other parts of Travancore. They give advice from former experience in conducting Honey Weeks to any interested persons or organisations at any distance.

Sent from Y.M.C.A. District Office,
Travancore and Cochin.

REPORT OF THE DEPARTMENT OF AGRICULTURE, UNITED PROVINCES

FOR THE MONTH OF OCTOBER, 1938.

I—Season.—There was general rain during the first half of the month. A few districts received light showers in the third week also, but the last week was practically rainless. Taken as a whole the rainfall of the month was below the normal except in the Allahabad and Jhansi Divisions.

II—Agricultural Operations.—Harvesting of *kharif* crops is nearing completion. Preparation of land, sowing of *rabi* and picking of cotton are in progress.

III—Standing Crops and IV—Prospects of the Harvest.—The condition of standing crops is generally satisfactory and prospects favourable except in flooded areas and certain western districts where *kharif* crops have been damaged by want of rain. The outturn is estimated at 8—12 annas in the rupee. Heavy and continuous rain in the eastern districts during the monsoon has resulted in much stunting of growth of most *kharif* crops, especially fodders and millets.

V—Damage to Crops.—Crops are reported to have been heavily damaged by excessive rains and floods in eastern districts and by want of rain in the Agra Division. Sugarcane has suffered heavy loss in the eastern districts by Red Rot and flooding of fields. Fodder crops in the western districts have dried up over large areas due to drought.

VI—Agricultural Stock.—The condition of agricultural stock is generally satisfactory except in areas affected by floods. The following figures showing cattle mortality have been furnished by the Director of Veterinary Services:

Disease	September, 1938		October, 1938	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	6 030	3,282	3,143	1,762
Foot and mouth ..	9,898	175	7,496	58
Haemorrhagic septicaemia	3,819	2,780	1,286	1,068

The figures show distinct improvement over the last month.

VII—Pastures and Fodder.—Fodder is scarce in the areas affected by floods and also in parts of the Western districts affected by drought. It is plentiful in the central districts and Bundelkhand.

VIII—Trade and Prices—The following figures compare the average retail prices of the chief food grains in rupees per maund at the end of the month with those of the preceding month. These indicate an increase in the prices of wheat and barley and decrease in those of rice and *arhar dal.*

	End of September, 1938	End of October, 1938
Wheat	2·285	2·807
Barley	2·188	2·344
Gram	2·737	2·737
Rice	4·032	3·964
Arhar dal	4·860	4·640

IX—Health and Labour in Rural Areas.—Public health continues satisfactory. The condition of agriculturist labouring classes is generally satisfactory except in flood-affected areas.

For November, 1938

I—Season.—There were light showers in the third week of November in a few districts, the rest of the month was practically rainless.

II—Agricultural Operations.—Sowing of *rabi* and and harvesting of late rice are nearly completed. Pressing of sugarcane has commenced.

III—Standard Crops and IV—Prospects of the Harvest.—Germination of *rabi* crops has been affected on account of the absence of moisture in areas of short rainfall. The condition of standing crops is generally satisfactory and prospects favourable except in flood-affected areas. A statement showing the outturn of various *kharif* crops as reported by the district officers is enclosed.

V—Damage to Crops.—No serious damage is reported during the month.

VI Agricultural Stock.—The condition of agricultural stock is generally satisfactory. Cattle diseases have declined as indicated by the following figures of cattle mortality furnished by the Director of Veterinary Services:

	October, 1938		November, 1938	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	3,143	1,762	2,971	1,618
Foot and mouth	7,496	58	3,675	30
Haemorrhagic	1,286	1,068	580	461
Septicaemia	..	..	.	..

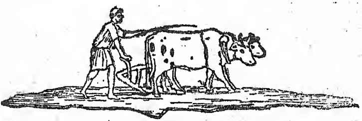
VII—Pastures and Fodder.—Fodder is generally sufficient except in the flood-affected areas and parts of the western districts which had short rainfall.

VIII—Trade and Prices.—The following figures compare the average retail prices of the chief food grains in rupees per maund at the end of the month with those of the preceding month. These indicate a general decrease in the prices of all the food grain except *arhar dal.*

	End of October, 1938	End of November, 1938
Wheat	2·807	2·690
Barley	2·344	2·103
Gram	2·737	2·711
Rice	3·964	3·673
Arhar dal	4·640	4·807

IX—Health and Labour in Rural Areas.—Public health continues satisfactory. Some cases of cholera have been reported from a few districts. The condition of the labouring and agricultural population is generally satisfactory.

THE
ALLAHABAD FARMER



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An Editorial.

Wanted a Dictator?

"India needs a dictator." This has been repeated in our hearing again and again that we have been forced at least to consider whether such a statement has any truth in it. The more we consider it however, the more we feel inclined to agree with it. For, as we look around us, we see that the progress is too slow. In agriculture, and we believe, in most other matters, India seems to need a strong hand. Crops in Government farms or in farms connected with agricultural institutions seem definitely to be superior to the crops of the villagers just across the road. But many of these villagers do not seem to want to change either their seeds or their methods of cultivation both of which having been handed to them by their fathers and their grandfathers. A cow in an agricultural institution may be giving 40 to 50 lbs. of milk a day, but that of the villagers is only giving 4 to 5 lbs. per day, yet how many of such villagers are seriously considering the improvement of their cows by careful breeding and selection. A man using modern implements can now easily

take care of 20 to 50 acres of land, whereas one using a *desi* (country made) plough can take care of 5 to 10 acres only. Can any one, therefore, deny the fact that if a strong hand is used the progress in our rural areas would be much more rapid than it is now ?

The above, however, do not seem to us to be so pressing as some other problems in agriculture.

One of the things we would like to see the Government authorities adopt as part of their immediate programme is the control of erosion. It has been pointed out again and again that erosion is robbing our nation of our very life blood as this process impoverishes the soil to such an extent that a field once considered to be rich is sooner or later depleted of its fertility. In order, therefore, that the Nation be no longer robbed of its heritage given to us by God, we plead that this waste in the form of soil carried down to the ocean be stopped at once A country-wide survey of agricultural lands in the province in order to find out the extent of damage done and also in order to find out where immediate steps should be taken to prevent this loss is, to our minds, very necessary for not only keeping up the fertility of our lands, but also for reclaiming those that are almost beyond hope of any possiblity for reclamation. Such steps, we have no doubt, will help to increase the productive power of the agricultural lands in this country, a thing sorely needed when a good part of our agricultural population go from one day to another without insufficient food. For it is indeed painful to see, as one goes around in these provinces, the dreadful loss that is caused to the country by man's attitude of indifference to one of the most important factors of production, namely, land. Lands that should be capable of producing the best kind of wheat that there is anywhere in the world is now only capable of producing *bajra*, a millet, so poor that it does not even pay the cost of producing it. Some lands have been rendered almost completely useless by erosion that only grasses of the very poorest kind would now grow on them. It is high time, therefore, that something more be done about it sooner or later, besides the very feeble

attempts made by the Forest Departments for attacking this very serious problem.

Another urgent matter that lies before us is the immediate expansion of irrigation facilities throughout these provinces. For, as long as we depend on rainfall and all its vicissitudes for the production of food for the Nation so long will there be uncertainties of the availability of sufficient food for us all. India, and more particularly the United Provinces, has been endowed by God with one of the richest types of soil that one may find anywhere on this Globe. And yet due to insufficiency of water in most parts of the province, the production of grain per acre is one of the lowest on record. Our experience has shown, however, that such soils when provided with irrigation facilities can produce not only one crop a year, but three or four of the most valuable crops, thereby increasing the productive capacity of the soil five to ten times what it was before irrigation facilities are available. Tube well irrigation, and the extension of canals wherever possible should be the immediate aim of those who are in authority with a view to increasing the productive capacity of all agricultural lands in the province.

These and many others require a strong hand; otherwise the progress of the country is apt to be slow.

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Mr. and Mrs. Hayes

Most of our readers know Mr. Hayes who was for years on the editorial staff of THE ALLAHABAD FARMER who has for one year now been the Officiating Principal of the Allahabad Agricultural Institute. He and Mrs. Hayes, the Institute doctor, will leave us some time in April, for a well-earned furlough in America. They will return to us in the Fall of 1940. Mr. J. N. Warner, the dairy expert at the Institute, has already been appointed to take Mr. Hayes' place in the editorial staff and will be the business manager of THE FARMER.

AGRICULTURAL EDUCATION

By

W. B. Hayes,

Principal, Allahabad Agricultural Institute.

Much misunderstanding exists regarding the purposes of agricultural education. Historically, the first purpose has ordinarily been to train staff for departments of agriculture, and many persons still think of this as the sole function of agricultural schools and colleges. In the early days of the development of scientific agriculture in India, experts were brought from abroad to fill the higher positions, but it was obviously impracticable to bring in all the trained staff which was necessary. Schools and colleges were started for the training of the subordinate staff. It continued to be expected that the higher posts would be held by men with foreign qualifications. This situation still holds to a large extent, although training of increasingly high standard has become available in India.

As the agricultural colleges developed, and the standard of education rose, men trained in India came to occupy not only the subordinate positions, but some of the more important ones, both in administration and in research. With great problems still unsolved, and large areas of Indian agriculture almost untouched, the need for research workers is obvious. Judging from the experience of countries far ahead of India in the development of agriculture, the time when further investigation will become unprofitable to the nation is not yet in sight. For positions demanding higher training than is available in india, it is still desirable that workers shall have had undergraduate education here.

One function which might at first seem perfectly obvious is the training of successful farmers. Yet to many this seems obviously not a function of agricultural education, at least that of collegiate grade. To them farming is an occupation fit only for the uneducated, or those with a minimum of schooling;

education gives men tastes and standards of living which cannot be supported by cultivating the soil. Unfortunately, there is a considerable measure of truth in this. Even if by modern methods the net income from farming can be doubled or trebled, the average farm will not support a family with any but a low standard of living. It is only by farming comparatively large areas that the educated man can hope to make a good living. Less land is required for specialized types of farming, such as dairying or growing fruits or vegetables, but for these relatively expensive land is needed, and even then more than the average farmer controls.

Nevertheless, a fairly large, and increasing number of young men with agricultural training are engaging in farming, with very satisfactory results in many cases. This is, of course, particularly true of the men trained in agricultural schools, as these are generally satisfied with a lower income than is demanded by college graduates.

It may be argued that a college education is not necessary to enable a man to be a successful farmer. It is true that a man who has had good training in an agricultural school, or who has studied agriculture in middle or high school, may be able to farm quite profitably, and from the financial point of view, the investment in a college education may be questionable. In a country where agricultural experimentation is advanced, and sound advice on all farming problems is readily available, there is less need for a thorough scientific education than here where so much is yet unknown. The Indian farmer has many problems which cannot be solved by reference to departmental bulletins, or by writing to experts. The agricultural graduate is in a much better position to solve these problems than is the man with less scientific training.

But there is an even more important aspect of the problem than the financial one. If education is conceived as developing the individual so that he can get the most out of life, by putting the most into it; if it is to give him a real appreciation of the world in which he lives; if it is to make of him a useful citizen of his country ; then a university course in

agriculture has tremendous possibilities. To those who think of culture as the study of the art and literature of past civilizations, it is absurd to speak of agriculture as a cultural subject. Yet consider for a moment what it offers the student. In this age when science wields such a powerful influence in the affairs of men, the agricultural student learns to understand the language of science, and to appreciate its methods; he studies the various sciences, not as isolated fields of knowledge, but as integrated phases, each contributing toward the understanding and control of life. Yet he must realize, as many scientists fail to do, that any control man gains over life is but partial and uncertain. He retains his sense of awe in the face of the mystery and the power of nature, his reverence for the God who conceived and created this marvellous Universe.

Many of the problems before the nations today are economic, and the agricultural student learns to deal with these also. For producing a crop is only half of his task, and he must learn to do so economically, and to market it at a profit. Many agricultural prices are set in the world market, and the policies of an American President or a Japanese Cabinet may determine what crops an Indian farmer should plant. Few citizens have the contribution which the educated farmer has to make to the solution of one of India's most pressing problems, the social and economic emancipation of the rural population.

History rightly plays an important part in education, but is the history of wars and of dynasties more important than the history of agriculture, of the gradual process by which, through the centuries, man has gained some measure of control over his environment, gained security, and put behind him the fear of frequently recurring famine? What an antidote for a narrow nationalism is the recognition that the crops he grows are the contribution of Europe, the Americas, and Africa, as well as of different parts of Asia, and that the methods he uses have been developed by men of every race.

If, then, agricultural education serves an important function in the life of the country, how far is this being realized by the students and their parents ? A few years ago the answer to this question would have been that there was very little demand for education of this type. But the situation is changing rapidly. This seems to be partly because of the difficulty experienced by young men with a general education in finding employment, and partly because of the increasing attention being paid to the villages. The interest of the present Viceroy and his immediate predecessor in the problems of agriculture and rural life are well known. The political importance of the rural population and large efforts to improve its condition have also focussed attention on the village.

One result of this growing interest in agriculture has been a flood of applications for admission to the agricultural colleges. This is apparently greatest in the case of Government colleges, as these are better known than the private institutions, and there is a belief that graduates of the Government colleges have a better chance of securing Government service In some ways, the number of applications for admission to a private college, such as the Allahabad Agricultural Institute, are more significant, as this college is less attractive to those desiring service. Facilities at the Institute are limited, and an entering class of about 35 only can be admitted each year, in the Intermediate course. This year only a limited amount of advertising was done, in papers circulating mainly in the United Provinces. Nevertheless, applications were received from various parts of the country, from Kashmir to Assam, to Travancore, and from Nepal and Ceylon. These totalled nearly 200, and several others would have applied had they not been told they had no chance. A few who could not be admitted to this course transferred their applications to the Indian Dairy Dibloma Course, where the competition was not so keen. An analysis of 183 applications, from eligible candidates yields some interesting facts.

The three provinces east of the United Provinces contain no degree college of agriculture, and from them came

more than half of the applications, 109. Thirty-eight applicants were from the U.P., and the others were well scattered. By religion, 133 were Hindus, 37 Moslems, 11 Christians, and 2 Buddhist. In age they varied from 13 to 26, the average being 18 6. This appears to be a very high average for an intermediate course, and is explained by the fact that 39 of the applicants had already passed examinations higher than the required high school or matriculation examination, and others had studied one or two years after passing their last examination. Nor is it true now, as it probably was once, that only those study agriculture who do poorly in other subjects. Of those who had passed only the high school or equivalent examination, 20 had passed in first division, 67 in second, 50 in third, and 6 without division. Six had passed the Intermediate Science in first division, 12 in second, 6 in third and 1 without division. In the Intermediate in Arts, 5 had passed in second division and 4 in third. Five candidates had passed the B.Sc. examination, two in the second division. That 60 per cent. were first and second division students indicates that they were considerably above the average in scholarship.

Very interesting are the answers given to the question as to what use the candidates expected to make of the agricultural training. It is possible that some coloured their answers in the way they thought would increase their chances of admission. Only 32 stated that their object was to secure service, while 57 said they planned to farm their own land. Another 53 have land, and are willing to engage in farming, but would prefer service, at least until they secure some experience. The question was not answered definitely by 41. Some of the candidates who showed the greatest anxiety to gain admission were those whose sole object was to prepare to manage their own estates.

Although 38 of the candidates were 21 years old or older, only 19, or about 11 per cent. were married.

Here were nearly two hundred young men, most of them well qualified, wanting training of a type which is greatly needed, and showing evidence that they would be able to

make good use of that training. Yet there was room for only a small percentage of them, and refusal was more difficult because very few could hope to get an agricultural education elsewhere.

This seems to indicate an urgent need for the establishment of more agricultural colleges, especially in those provinces which at present do not have any. There are now five Government colleges teaching for the degree in agriculture: those at Lyallpur, Cawnpore, Nagpur, Poona, and Coimbatore. The Khalsa College, Amritsar, and the Allahabad Agricultural Institute are the other degree colleges in agriculture. There is obviously room and need for more institutions of this grade Financial problems make it difficult to meet this need promptly. Agricultural education is expensive, requiring the laboratories of the science college and land and equipment for a modern farm, with a wide variety of crops and animals.

Lower grade institutions are also insufficient. In the United Provinces, in addition to the two degree colleges, two institutions offer the Intermediate course in Agriculture. Both are private, and with barely the staff and equipment necessary for this course. One of them has opened Intermediate classes in agriculture only in 1938. There are also two agricultural schools operated by Government, and a few run by private agencies. Agriculture is an optional subject in the high school course, but is offered by only a very few schools. With the modern emphasis on rural life, and on education suited to the needs of the people, it is to be expected that the number of schools teaching agriculture, either as trade schools, or as general schools with vocational courses, will be greatly increased. This in turn will call for more agricultural graduates, as teachers and inspectors.

Agricultural education has made a good start in India, but it is only a start. There is need and demand that it be greatly expanded. Will those who pay lip service to the cause of rural development see to it that financial difficulties are not allowed to obstruct progress in this extremely important part of the programme?

THE IMPORTANCE OF BETTER AGRICULTURAL IMPLEMENTS IN THE IMMEDIATE FUTURE OF INDIA.

By

Mason Vaugh.

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I should like to approach my subject somewhat indirectly by stating some economic truisms which we all know but often forget or neglect when discussion rages around subject affecting our traditional habits and customs. The following are important in the discussion to follow.

1. We can divide among us only what we produce. Even with the most perfect distribution of wealth, income, privileges, we can jointly have only what we produce among ourselves. Savings of the past cannot affect materially the standard of living for any time, nor can we really live on the future.

2. The standard of living of the average person is determined by the average production per worker. Unequal distribution may lead to me or to you getting an undue share for a time, more or less than we deserve, but on the average, the common production of useful commodities and services is a function of the production per worker. Modern statistics which tell us of the crores of maunds of wheat produced in India tends to help us forget that Ram Lal only has 10 maunds, because that is all he produced.

I think that no one will have difficulty in agreeing with me this far. The next step may cause more difficulty. *The production per worker is primarily a function of the tools and power with which he works.* Undoubtedly other factors are of some importance. Climate may make life easier where less is required or where production of some thing is easiest. Richness of soil, availability of natural resources, have their effect but after all the effect is more apparent than real. Climate may be modified to the extent

that with the proper equipment it is possible to grow tropical plants at the North Pole and serve ice-cream regularly in India in the hot weather. Soil is remarkably uniform over the world and is more or less fertile, mainly according to how the population has treated it. We irrigate, drain, fertilize to get the soil conditions we require. Some of the useful minerals are unequally distributed but we are learning that there is almost no indispensible material or product. There is a substitute for practically any natural resource if we know how to make it or to win it from nature.

It is a little known fact that the richest agricultural regions of the world are those where the soil and climate are relatively unfavourable. The places where a relatively favourable temperate climate is associated with an extremely fertile soil, few and poor implements, high production per acre, are the places where there is the most abject poverty known. Production per acre determines the number of persons a given acre can feed to a certain standard. High production per acre does not necessarily or even usually go with high production per worker and so has comparatively little direct influence on the standard of living of the farmer. The combination of the two factors, production per acre and number of acres cultivated, does determine the total production and that combination which will give the highest total production per worker is the one which will give the standard of living which will be the most satisfactory.

Let us start again on another line of thought. Primitive man was dependent presumably on the gathering of the wild fruits and grains for his food. Even hard-shelled nuts which he could not crack with his teeth were of no use to him. When he first cracked a nut with a stone, he began to use a tool. Primitive tools such as spears, knives, bow and arrow, widened his range of food, made available not only food but skins for clothing, we might say raised the standard of living. The history of human culture, of human comfort and leisure is a history of progress in the use of tools and implements with which to secure food, clothing, shelter, in the least time possible so as to allow time for other satisfying activities.

Perhaps we should define the term "standard of living". I conceive of life as being made up of not only food, clothing, shelter, which are necessary for existence and any degree of comfort, but also of culture, music, religious exercises, all those things which contribute to a full, rounded, happy life To me, a high standard of living must include not only sufficient food, adequate clothing and shelter, but also leisure to enjoy the beauties of nature, time for religious exercises, cultural pursuits such as literature, painting, and association with my fellow men in social activities.

India is still in a primitive agricultural stage. She still uses the tools and implements largely as they were developed hundreds and thousands of years ago. The *deshi* (country made) plough as now used is not essentially different in shape and in work from what it was a thousand years ago. As a result, the production in India is nearly the lowest per worker of any country in world. The following table was compiled some years ago from reliable data by economists.

Country.	H.P. per worker	Ratio of output per worker
America	3·77	35
Great Britain.. ..	2·40	24
Canada	2·20	22
Belgium	1·90	19
Germany	1 50	15
Czechoslovakia ..	1·15	11·5
Austria	1·00	10
France	97	9 7
Holland	·75	7 5
Poland	·41	4·2
Italy	·31	3 1
Japan	·22	2·2
Russia	·16	1·6
India	·14	1 4
China	·12	1·2

Before we go further, it should be emphasized that tools and implements require to be worked by some source of power, either human, animal, or mechanical. The tool, whatever it is and the power to work it whatever it may be,

are inseparable. Generally better tools and implements fail to make their maximum contribution unless they are adequately powered. On the other hand, a large pair of bullocks is of no great value harnessed to a small *deshi* plough. Our table shows two things, the ratio of production per worker and the power per worker available in the country.

It is admitted by all that the standard of living in India is low, that the income per family or per productive worker is unsatisfactory, below that necessary to provide a reasonable amount of food and clothing for comfort; let alone anything for luxury. Many reasons have been given for this but in the foregoing statements we have the basic reason, poor tools and inadequate power per worker.

Let us examine more closely why the production per worker is low in the agriculture of India. The most commonly given reasons are over population and excessive pressure on the land. Fragmentation of holdings, loss of export markets, the *banya* (small treader) have all been considered subsidiary causes. Even the decay of cottage industries and rise of mill industries are cited as causes.

There is undoubtedly at present a shortage of food, less than enough to provide a satisfactory standard of feeding for the present population. I do not consider that that means necessarily a reduction in the present population. I do not know how much farther India can go in increasing her population and still be able to feed it, but I am satisfied that production of food-stuff can be increased to give an adequat food supply for the present population and that simply reducing the population will similarly reduce the production and leave us where we were. I am convinced that the standard of living is rising in India at present, not falling. I see products commonly used now that were unknown when I arrived in Allahabad. The standard of clothing, the extent to which shoes are worn, sales of that "indicator of civilization", soap, all point to this conclusion.

As I study the rural problems, I find no surplus rural population. There is poor utilization of the rural population's

productive capacity, seasonal unemployment, but there are considerable periods of the year when no surplus labour is available in the villages, when men, women and children are fully occupied with seasonal work. I would emphasize that phrase, "men, *women and children*". During the period of July to November inclusive, possibly including most of December, people are rather fully occupied. In March, the need for labour to harvest to crop is so great that in many places it is customary to even close the schools for a time to get the harvest done—and that in spite of the low proportion of children in school!! Undoubtedly there are seasons when work is slack - January and February, and the hot weather are relatively free. At other seasons, the rural population works at least the 8 hour-day and often much longer. I will refer to the effect of this fact on the problem of cottage industries later on.

I, therefore, conclude that there are two important phases to the improvement of Indian agriculture: (1) the increase in total production and (2) the increase of production per worker. As the latter is probably the more important, let us discuss the points in this order.

An increase in total production may be secured by increasing the total area cultivated and by increasing the yield per unit acre. While a large proportion of the culture-able area of India is utilized, there are probably 5,00,000 acres in the United Provinces which are capable of being brought under cultivation, with similar areas elsewhere. Most of this area is unculturable with present implements in commmon use, either because it is infested with jungle or heavy rooted grasses. Better implements, not necessarily very big or expensive units, will enable much of this area to produce food, feed for animals, and fibre. The use of the larger sizes of steel ploughs drawn by the better Indian bullocks will enable much if not all of this area to be brought under profitable cultivation. This additional area will make a considerable difference in the total food supply available. Increase in yields per acre have had much more attention in the past than yields per worker. Notable increases in yields have

been secured by plant breeding, the outstanding example of this being the Coimbatore canes. Other useful but smaller increases have been made in the staple crops. Some gain has been made in the introduction of crops from other countries. The average increases from these sources have been of the order of 15 per cent. While progress from such work may still be hoped for, it is not likely to be spectacular.

Very much greater increases may be made in yields per acre by better soil handling methods including manuring. The fields now cultivated are in many if not most cases infested with one or another kind of grass or weed which has become adapted to the conditions and which thrives under them to the detriment of the crop. *Dub* (*Cynodon dactylon*) grass is an example. Little progress can be made against these weeds without a change of implements; with the change, material increase in yields may be expected in many cases.

Probably the greatest increase can be expected from manuring. The greatest need of Indian soil is organic manure. Far greater increases in yield than from any other source can be made by increasing the organic matter content of the soils. I estimate that average yields can be doubled over much of India by this one thing. A soil inverting plough will help more than any other one thing by making green manuring and the saving of crop residues possible. Of course other things, crop rotation, conservation of animal manures, composting of weeds and other waste will all help but alone cannot fully meet the need.

Many explanations have been offered for the small area per cultivator in India, the most common being the land inheritance laws which divide the area among all the sons. I would like to call your attention to a little recognised fact. We have various figures quoted per cultivator, the most common being the total cultivated area of a province divided by the number of registered owners of cultivating rights. This may have little or no relation to the area actually worked by a family. There are some registered cultivators who have small areas which they cultivate while earning the main part of the family income from other sources. Sub-

letting is a very common practice so that cultivators having statutory rights to very little land often cultivate much more than is entered in the *patwari's* papers in their name. Such investigation as I have been able to make shows that the area *actually cultivated* per farmer very closely approximates the area which can be cultivated with one plough in each particular area. Around Allahabad, it is about 5 acres. North and west, with better irrigation facilities and better cattle, the area rises to nearer 10 acres in the Punjab. In Central India and Central Provinces with different soil, somewhat different climate and different crops the area may be upto 15 acres. Those who have rights to lease land, rent more or sub-let; those who have too much sublet.

If the area now cultivated by the average farmer is the area he can cultivare with his present implements, better implements should not only enable better cultivation, but should make possible the necessary cultivation by fewer people. I hope this will be the result in India as it has been in other countries. This need not necessarily mean unemployment at present, at least. Under existing practices in India, 3 to 4 people are required to every plough unit of land. Not only is the ploughman required but also people to do weeding, help with the seeding, harvesting and other kinds of work not now done with animal power. These auxiliary labourers are usually women and children. It is not possible for a women to work in the fields 8 to 10 hours a day and at the same time give her children and her home the care necessary to train the children or to make a satisfactory home for her family. We will not have the sort of family life, the sort of home we should have, till we release the women from the necessity of labouring in the fields. We lament the few children in school and the low standard of literacy. We cannot expect a large proportion of the boys and girls to be in school until we relieve them of field labour. My first objectives therefore in introducing better implements would be the double one of making possible better practices looking to a higher acre yield and the release of women and children from field labour. It should be noted here that in the case of hired labour, where the man does the

work of man, woman and children, he should get the pay formerly gotten by all of them—otherwise the labourer's condition will be worse than before. Even though the employer does furnish the equipment and the brains for the improvement, the labourer must be allowed to share in the increased production. This is not only a matter of ethics but of economics as well. The discussion of this point would furnish material for a far larger paper than this, but we should note the principle in passing at least. Though its recognition has been widespread recently, probably Henry Ford more than any other one man pioneered the idea.

I must not evade the issue of unemployment which my statements raise. Undoubtedly any change in systems of production means dislocation of labour temporarily. If there is to be development of industries and if there is no surplus of labour in the villages now, there can be no really important industrial development unless labour is released. I find that at certain seasons of the year casual labour for building work simply is not to be had and the work has to be planned accordingly. I therefore am convinced that we can go quite a way with introducing better farm implements without causing unemployment. Eventually we must recognise that the ultimate desired objective of the introduction of anything better is to enable us to have more of the things we desire and to have them with less labour. There will come a time when we will be able to reduce working hours, when we will be able to have for everyone enough of everything except leisure. I believe we will all admit that that is the ideal, at least for ourselves. We may feel that it is a good thing for the other fellow to have to work so he will not find leisure for deviltry. For ourselves, the minimum effort which will get us what we want is the ideal.

From the time the first man cracked a nut with a stone until now, we have always taken advantage of every improvement in our means of production and political theorists to the contrary notwithstanding, I think that is likely to continue to be true. If it is, we must accept that India will increasingly use the equipment developed in the West

and develop other things for herself to increase her production both agriculturally and industrially. If that is true, we can get more of the non-agricultural products only as we release men from agriculture to make them For my part, I welcome the development as one which will improve living conditions for not only me and mine but for my neighbours as well. If this development is inevitable, the sooner we recognise the fact and plan for it, the more smoothly it can come about and the less the suffering that will be entailed.

I promised to discuss the bearing of this on the question of cottage industries. We have heard a great deal in recent years about the "decay of cottage industries" and the need for reviving them. Lacs and crores are being spent on encouraging hand-spinning and weaving and other cottage industries. I freely admit the defects of the factory system as it has grown up in the West. Part of them are due to factors now traditional but originally due to limitations of knowledge and equipment, for instance the necessity to concentrate all work withinthereach of shafts and belts from the steam engine. While admitting the defects of what we have, I at the same time see no possibility of going back to former hand methods of production or even of holding our present methods static. The man with the better tool can and will do more and better work, have more product, to use and exchange with others and will be imitated by his neighbours. We can encourage and perhaps guide this development in the interests of society. We cannot stop it.

I am opposed to efforts to build up cottage industries and favour the gradual replacement of those we have with something better. Possibly before I go further, I should define what I meen by "cottage industry". To me a *cottage industry is any non-agricultural occupation carried on in the home by members of a family making products for sale to others.* While I agree that they should be eliminated gradually by the substitution of something better and not by wholesale destruction, I am definite in my belief that the elimination should occur. My opposition is based mainly on two things: (1) The cottage industry does not enable the

producer to utilize the best equipment, adequate power or technical knowledge and skill. The mental capacity and physical ability of men differ. A group working together can more effectively carry on work by each contributing his best ability to the group. In the factory, managerial ability, technical training and physical labour can be much more effectively combined than in any system of home industry involving single workers or members of only one family working alone. (2) The carrying on of work not connected with the home in the home results in the enslavement of the worker and often of the worker's faimly. Because of the limitations mentioned above, the income per worker is poor. To inciease it, he works long hours and often or usually impresses into the work, his wife and children as well—and you have the "sweet-shop" of the West which the labour unions have fought so long and hard. This feature cannot be eliminated. No law or system of supervision will enable any government to control it. It is a cancer which can only be cut out, not controlled. I am speaking of course of cottage industry according to my definition, not of the making in the home of products to be used in the home That is another matter.

The situation is even worse when we consider seasonal work. The suggestion that people should farm in season and spin, weave or what have you in other seasons is not new. It ignores several fundamental facts. Spinning, weaving and other such occupations require a type of skill of their own. Progress in the past has been along the line of the division of labour—for instance, the caste system in India. Since the earliest time, the tendency has been to have certain members of every community do certain kinds of work and any other arrangement has been common only in primitive communities where families have to be self-contained. There are doubtless places in the world where, as in India, persons following some other primary occupation, also do some cultivation. I know of no place where those whose primary occupation is cultivation successfuly carry on manufacture at odd seasons. Some years ago a missionary group thought they had found an ideal situation for seasonal industry in Western China. The winters were cold and woolen

blankets and cloth for other garments were needed. Sheep were or could be grown for wool supply. They accordingly got improved spinning and weaving equipment, sent people to school for training in spinning and weaving and in a couple of years established quite an industry. However, they found that instead of all members of the family working the land in summer and working the wool industry in winter, each family set aside one or more of their number who worked intensively at the wool the year round, while the others carried on the cultivation as before.

The suggestion has been made that small factories be established in which cultivators could work during the slack seasons, the factories shutting down or being run at much less active standard during the seasons when there was field work. The factory working intermittently is at a disadvantage because interest on investment and to some extent depreciation as well as maintenance must go on whether the factory works or not. When these things have to be spread over the products made in only part of a year, they form a much greater part of the expense than if they were on a whole year's production. If some industry utilizing agricultural products and seasonal in nature can be found which comes at the time when work is slack in the fields, it may be possible to work some such scheme. The greatest trouble with seasonal industries is that the work to be done, tinning of fruit and vegetables, for instance, has to be done when the product is ready. The making of *gur* cannot be postponed till May and June when there is nothing else to do ; it must be done when the cane is ripe. The factory which can work all year is the one which will make the most profit or which will be able to undersell the seasonal factory consistently. Small factories, employing local people are certainly better in many respects than the huge factory to which materials have to go from a long distance away and which must draw labour from a distance. They should be encouraged wherever local materials or labour is available and power can be had at reasonable cost. Let them be full-time factories, however.

The problem of the farmer's spare time can be tackled in other, and to my mind, better ways. It is far better to make the farmer a full-time worker in his own job than to try to arrange for him to have two different jobs. I believe it is possible to spread the farmer's work over a much longer time by the adoption of better implements Ploughing the hot weather relieves the rush to sow when the rains do come as well as securing other benefits. The introduction of better irrigation facilities will make possible the growing of crops during the hot weather as well as during the other seasons. Diversification of crops and the keeping of animals such as really producing dairy cows and chickens will give a longer agricultural year for the farmer in his own job and far more profit than any handicraft he can take up as a spare time occupation. Most of these changes can be made only as the farmer can get the requisit equipment for the work.

To summarize briefly, the average standard of living can only be equal to the average production; production per worker is primarily a function of the tools he uses and the power he controls; high yields per acre are desirable in agriculture, but are less valuable than high yields per worker, so long as all can be fed; standards of living in India are low because the production per worker is low; seasonally at least there is no surplus rural population; industrial production of non-agricultural products will only increase as labourers are freed from agriculture to do the work; at present, methods and equipment in use require women and children to work in the fields, hindering schooling for children and a high standard of homemaking by the women, but with better equipment, the men can do the work alone; cottage industries are decaying because something more effective is coming into use; efforts to perpetuate them are futile and undersirable because they do *not* give efficient production and *do* enslave the whole family; seasonal manufacturing of products for sale is uneconomical in factories and not the best way to use the time and ability of the farmer; the farmer's condition and with him that of the country as a whole can be better served by giving him better equipment and methods for his main job, that of farming.

PLANT SANITATION

By

S. Chowdhury

The diseases of plants and animals are on the same footing to the extent that they are in many cases produced by micro-organisms which are adapted to exist as parasites and so produce consequences which are injurious to the hosts at whose expense they live and multiply. These micro-organisms are readily disseminated by air, water, insect or contact; and the science of plant and human pathology work on very similar lines in studying them and devising means for their control.

Plant diseases like human maladies can be dealt with in various ways. The best means of dealing with disease, if one may so put it, is to avoid it altogether. With cultivated plants this desirable end can usually only be achieved by obtaining varieties which are immune or very resistant to the most serious pests whether insect or fungoid. With certain human diseases, *e.g.* small pox, an artificial immunity can be conferred by vaccination, but similar methods of establishing immunity in plants cannot yet be applied chiefly because there is nothing comparable in plants to the blood stream in man with all its latent healing properties circulating rapidly through the body. Of course in plants it is possible to breed disease-resistant varieties and this has already been done with many annual plants, especially the cereals, with great success; and one looks forward to the time when similar developments will take place with perennial plants such as fruit trees, although success in this direction will necessarily be slower. Again it does not follow that because a plant is immune from one disease that it escapes attack from other diseases.

In human illness medical means are applied to effect a cure. Thus some drug is taken, or injected into the blood, which either exerts a stimulative action enabling the body to throw off the malady or which by some directly poisonous effect, kills the parasite responsible for the disease. In plant

pathology internal application of drug can only rarely be applied with any hope of success, chiefly because the higher plants possess nothing comparable to the blood stream of animals, the movements of sap in the former being essentially different from the latter. There is however a mode of dealing with certain insect and fangoid pests which is of the greatest importance to cultivators and which can be compared in some respects to medical treatment......spraying with insecticides and fungicides. As is well known, insecticides are usually most potent when applied just as the pest is emerging from the resting state or at any rate before the insect is abundant in an active condition. Similary fungicides must be applied before the appearance of the fungus in an infectious form in order that the leaves and stems may be protected from penetration.

Finally there are the surgical and sanitary methods of dealing with plant diseases. At a time when sanitary measures are assuming increasing importance in controlling human and animal diseases it is painful to note that it has not yet received the attention it deserves at least in this country as a means of coping with the diseases of plants. In the majority of the fruit gardens in Assam practically no attention is given to sanitary methods. This is mainly responsible for the huge monetary losses that the growers suffer annually from fungoid diseases and insect pests. Diseased limbs of plants are rarely severed from the parent plant and burnt. If, however, the dead, diseased limbs are separated they are allowed to rot in heaps in the orchard only to serve as a breeding ground and multiplying centre for the disease-causing fungi and insects. Weeding of course is always neglected and weeds of all kinds are allowed to grow unchecked only to serve as harbourage for fungi and insect pests.

Fruit trees in particular lend themselves to surgical treatment when attacked by certain diseases. It is not the case here that if one member of the plant body suffers all the other members suffer with it, for the unruly limb of a fruit tree can be severed with nothing but benefit accruing

to the remainder of the tree. In plant sanitation, one aims at the eradication of the sources of infection. This is a point of view which should be kept constantly in mind by the cultivator. It may be urged that it is impossible to eradicate completely the sources of infection in the case of the commonest plant diseases. Be that as it may, and certain human diseases such as yellow fever have been wiped out in part of the tropics solely by the application of sanitary means, conviction is firm that many of the most serious fungoid pests can be greatly reduced by destroying their breeding grounds which are left either within or near fruit plantations. It is a well-known fact in medical science that in diseases of parasitic origin like malaria and tuberculosis the magnitude of the dose, so to speak, of the parasite frequently determines whether disease is established or not. If only a few germs are absorbed the parasite may not be able to establish itself, while if many are taken in disease will develop readily. The same factor operates with certain plant diseases.

The first principle of sanitation is to avoid as completely as possible any harbourage for the breeding of insect and fungoid pests. This postulates the cutting off of branches which are dying back and their speedy destruction on the spot by fire or removal from the plantation. If the severed branches are allowed to remain in the plantation, the fungus which killed them will soon fructify and shed its spores around in the same way as if still attached to the standing tree. There is no reason why these prunings should not have been burnt as soon as collected. In cutting out diseased branches, action must be sufficiently drastic to ensure that the downward limit reached by the fungus is exercised. Where a tree is dying back to such an extent that its loss is inevitable, it is important that the stumps should be removed if possible at the time of felling.

Some diseases of fruit trees especially those of the die back variety are highly contagious, and may spread through an orchard by means of the tools used in pruning, as well as, by other agencies, such as birds and insects. To reduce the

risks of diseases of this nature every grower should make a practice of sterilizing his secateurs after each tree has been pruned. This can be done by washing them in a 10 per cent. solution of corrosive sublimate. If the debris left on the blades of the pruning shears, after a diseased tree has been pruned, is examined with a microscope, it will be found to be full of spores and scraps of mycelium of fungi all of which will grow if placed on a newly cut surface on a healthy tree. Amongst these fungus elements there are sure to be some capable of reproducing the disease and the healthy tree is thus infected. If the pruning tools are washed in a suitable disinfectant before work is begun on a new tree, all this infective material is destroyed and the risk of disease being communicated is reduced to negligible proportions. Observations will show that die back diseases nearly always follow the course of the pruner who unconsciously carries the infection on his implements. A solution of formalin can be easily carried in a tin with a string handle, so that it can be hung upon a twig when not required for use. If saws, secateurs or knives are used, they should be washed before being used on a new tree. Even if there is no disease apparent in the orchard the practice of sterilization should still be followed as part of the ordinary routine. It is quite possible to convey the eggs or living individuals of dangerous insect pests from one tree to another by means of the pruning tools, as well as the spores of parasitic fungi. This is especially the case with some of the scale insects and aphides. Washing the pruning tools in a disinfectant will do away with this danger completely.

In the case of root attacking fungi, such as *Armillaria mellea*, it is easily possible to carry infection on the implements of cultivation or even in the earth adhering to the feet of the labourers. Eelworms may be spread in the same way. It is not desirable to plough close to trees affected with *Armillaria* for this reason. The ground round them should be worked with a hoe which should be carefully disinfected before being used near healthy trees.

Great care should be taken in controlling such diseases as brown rot of apples and plums which in certain seasons levy

a heavy toll on the fruit. In the main this trouble is carried over from season to season by fruits which, mummified by the action of the fungus, hang upon the trees during the winter or lie on the ground. Where brown rot is liable to be severe, it would be worthwhile to have these mummified fruits collected and destroyed during the winter. Again the common scab fungus *Fusicladium dendriticum*, usually hibernates in the young twigs of the most susceptible varieties of apples and while pruning is being done, care should be taken that all the twigs which show small pustules in the bark should be cut off.

A number of fungi which are strict parasites when the trees upon which they live are in leaf become saprophytes in the winter, and live in the dead leaves on the ground until spring comes and conditions are once more suitable for them to assume the parasitic form. For this reason the dead leaves should be ploughed under as soon as they have all fallen from the trees. When turned under in this way most of them rot away very quickly and the fungi in them are deprived of suitable food and cannot develop. The chain of their life-history is therefore broken and the summer forms do not appear at all or only in a reduced degree. The black spot (*Venturia inaequalis*) is one of the fungi that passes the winter in the dead leaves in which it assumes a form totally different from that which it has in the summer. Ploughing in the dead leaves often causes it to almost disappear. When the dead leaves are allowed to lie on the surface all the winter, the spores of the winter form are developed in millions and every time that the soil is disturbed in the spring myriads of them are liberated and blown on to the trees thus re-infecting the leaves and fruits.

The leaf-spotting fungus *Sphaeropsis malorum*, is another that is perpetuated largely by means of the fallen leaves. Unlike *Venturia inaequalis*, this fungus often attacks the bark and produces cankers which kill limbs or whole trees. It is commonest on the leaves, however, and if these are properly dealt with the disease is reduced to small proportions. The more humus there is in the soil, the

more quickly and completely will the ploughed in leaves rot away.

When cankers appear in the bark of trees the diseased portions should be at once cut out and burned. All the unhealthy portion should be removed until nothing but sound wood and bark is left and the wound should then be disinfected with Bordeaux mixture and painted over with good white lead paint. If this is properly done, the place will soon be covered up with a healthy callus.

Care must be taken to prevent the development of dangerous fungi not only within the planation but also in its immediate vicinity.

Sunlight and air are important points of all sanitation, and therefore merit serious consideration in connection with plantations. One has only to examine trees adjacent to and shaded by shelter or other trees to see the spindly undeveloped growth produced where sunlight and air are partially witheld from the tree. This kind of wood is unable to give the necessary support to a payable crop of fruit, is readily susceptible to attacks from pests and diseases, and the trees are generally in a declining condition. Compare this class of growth to the robust condition attained by trees that are in direct sunlight and one is forced to the conclusion that light is essential throughout the orchard and throughout the framework of each tree.

A free circulation of air is required by trees for proper development. Shelter is a very important factor in fruit growing, but can be carried to excess and create a stagnant air condition, which is far from desirable. The ideal shelter should be open enough to permit a free circulation of air, yet break the force of wind.

"In all things do your best. The man who has done his best has done everything. The man who has done less than his best has done nothing."—*Church M. Schwab.*

THE SHABASH PLOUGH

By

Mason Vaugh

Agricultural Engineer, Allahabad Agricultural Institute.

The Agricultural Institute has recently added to its line of agricultural implements especially designed for conditions in North India another small plough. Its older plough, the Wah-Wah, had been widely sold and is gaining wide use but there is a demand for a cheaper plough even though it may not have the advantage of being able to meet all needs at all seasons of the year.

We found that considerable numbers of cultivators were buying steel shares made for the Wah-Wah and fitting them onto Meston and Gurjar ploughs to their satisfaction. However, there was still some complaint that the plough body itself broke when any hard obstacle was encountered and that a lighter weight would be an advantage. Both these things indicated the need for an all-steel plough.

To meet these needs, we have designed and tested for a period of three years a small plough generally similar to the other small ploughs being sold under various names in North India. It is now on the market under the name of the "Shabash" plough. It is of all steel construction, made by electric welding and hot forging from steel made in India. It is made for use with a wooden beam and handle of the same style as the Meston or Gurjar plough and similar ploughs, and its use in the field is in all respects similar to these ploughs.

Our tests show however that it is superior in several respects. The all steel construction definitely guarantees against breakage of any part of the plough as the result of use in the field. Its light weight, while probably not making much difference in the actual draft in the soil, is an advantage when the plough is to be carried to or from the field. The shape and slope of the mould board have also been modified

to give an easier passage of the soil across it, resulting in better covering of vegetation with less draft.

The "Shabash" plough is well made of first class material but it is not intended to replace the "Wah-Wah" plough in any sense. It has the limitation of being useful for only a limited part of the year when it is desired to invert the soil and not at other times. It therefore does not give the economy of labour which can be secured by the use of better implements. It is intended primarily to meet the demand for a very cheap implement to meet the competition of the other small ploughs of a similar type now on the market. The present retail price is Rs. 4-8-0 for the iron parts only, or Rs. 5-12-0 for the plough complete with wooden beam and handle.

The U. P. Government has decided to stock these ploughs in a certain number of Seed Stores for sale to the public to test the demand for an all steel plough as compared to the demand for the types previously sold. It has not yet been decided as to which stores will be selected for this trial, but it is expected that the ploughs will be available in some stores by the time this appears in print.

The Institute has also carried out tests of the Wah-Wah cultivator attachment particularly for final preparation of the *rabi* seed bed just prior to sowing. The soil inverting plough is entirely suitable for all ploughing done during the rains but something else is need for the period of the month or more between the end of the rains and the seeding time. For this, an implement which will give a light, shallow surface cultivation, covering the ground rapidly and evenly, up-rooting weeds and grasses but disturbing the position of the top layer of soil as little as possible, is needed. It should do essentially the work of the *deshi* plough in quality but should accomplish more in the day than a *deshi* plough can. In some soil conditions, the Wah-Wah sweep has done good work and enables one man, one plough, and a pair of bullocks to do about double and in some cases three times the work he could do with a *deshi* plough. This however has not been entirely successful under all conditions and the present tests are being

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BY

MASON VAUGH

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... ordinary cultivator.
... deterred most. Secondly,

The Agricultural In...ough to dig in when the ground is at ... if they did, the load would be too much for most pairs of bullocks as the harrows have been available only in large sizes of 7 or 9 tines. As commonly used for shallow working and to lighten the load on the bullocks of digging deeper, the frame of the harrow drags on the ground, resulting in severe wear and the necessity for frequent and expensive repairs. Some trouble is found with the tines bending also. Still another difficulty is that the spring-tooth harrow tends to clog badly if the ground is at all trashy, as it acts as a rake to gather up any weeds, grass or stubble in the soil as well as that on the surface.

Present tests indicate that the Wah-Wah cultivator will be an excellent substitute for the spring tooth harrow in every respect. Its cost is only about one fifth that of a spring tooth harrow. It can be varied between three and five tines to suit the power of the bullocks and with five tines does about the same area as a spring tooth harrow. Under easy conditions, five tines seems to be well within the power of the better village bullocks and three can be handled under almost any conditions where a cultivator should be used. Due to the better placing of the tines and the absence of a frame dragging on the ground, it is to a large extent self-cleaning unless the conditions are very very bad and then the handle provides an easy means of lifting and clearing it. The frame is made in such a way that there is little chance of wear of any part other than the cultivator steels which are easily replaceable at small cost.

It seems likely also that the Wah-Wah cultivator attachment will be entirely satisfactory as a substitute for the *deshi* plough for shallow surface cultivation.

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for an educational tour.

Jubbulpore: Early in the morning of 29th December, 1938, we reached Jubbulpore and visited the Adhartal Farm. The total area of this Government Farm is 600 acres, out of which 300 acres are under cultivation. As a result of selection AO-90 has been found to be the best wheat. It is highly rust resistant and yeilds about 800 to 1,000 lb. per acre. The officers of the Agricultural Department have also selected a variety of peas which remains green even at the time of ripening and after harvest. The best fodder crop recommended by the farm is Mushyal *(Iseilema laxum)*. The soil of the region is so hard that tractors have failed, and now a steam tackle is being tried successfully at a running cost of Rs. 9 per acre. It consumes 10 to 15 maunds of fuel per acre and covers only 6 to 8 acres a day.

In the afternoon we visited the Government Military Dairy Farm and then the famous marble rocks of Jubbulpore. The excellent charm and beauty of the wonderful marble rocks enthralled us while we were enjoying the delightful boating in the Narbada river. The water was perfectly clear, the breeze was pleasant and the high rocks on either side with various shades of colours provided a glorious scene. Our eyes were all the time fixed on such remarkable sight of natural beauty, which is more or less hidden from the outside.

Nagpur: We reached Nagpur on the 30th of December and stayed at the Agricultural College, Nagpur. Next day we saw the college farm. The different varieties of

crops recommended by the farm are as follows:—Howrah wheat; linseed E.B. 2 and 55 F; cotton E.B. 31, verum 262 and verum 434; groundnut A. K. 12/24 and Spanish peanut. The college dairy has found Montgomery to be the best breed of milking cows and Hissar, the best dual purpose breed for Central Provinces. The oilseed specialist has found an entirely new use for linseed fibre. He has been successful in bleaching and mercerizing it for making cloth, ropes and carpets.

In the afternoon we visited the Byramji Dairy at Telinkheri. It is one of the best co-operative dairies. Dr. Wright, in his recent report, has remarked that this dairy is not a blind follower of Western methods. The members of this dairy keep their own animals and are responsible for their feeding and milking. The society helps them in the marketing of dairy products and the purchase of fodder. Cows are graded with the Montgomery and the buffaloes with the *murrah* breeds. The poultry department of this farm has devised a new iron Clyde incubator costing Rs. 110 with a capacity for 100 eggs. Among the different breeds of poultry, Well Samar, a popular English breed, has been recently introduced. It is 94% sex-linked, resembles the country breed in colour, but the weight of coffee-coloured eggs is 2¼ oz. each.

Wardha: We had the golden opportunity and a proud privilege of meeting Mahatma Gandhi on the New Year's Day at his lovely residence in Shegaon, which is far from Wardha proper. The *ashram* has an area of 100 acres and maintains a farm for village uplift. The object of this institution is to make an Indian village self-sufficient. The children from neighbouring villages have a spinning class and the adults are taught in a night school. Gandhiji gave us a very short interview making several witty remarks. In the end he told us plainly that his blessings would be with us only when we had a firm determination to serve our fellow countrymen by undertaking village uplift work.

On the 2nd of January, 1939, we visited the museum and the centre of the All India Village Industries Association

at Wardha. The main industries include paddy-husking, flour-grinding, paper-making, bee-keeping, oil-pressing, *gur*-making, leather-tanning, spinning, weaving, and palm jaggery. The demonstration of all these industries was very useful for all of us.

The processes involved in palm jaggery are very simple and within the reach of all villagers. The quality of *gur* manufactured from the juice of palmyra, *sags*, coconut and date-palm is much superior to the gur manufactured from cane juice in taste, flavour and dietetic value. Palm jaggery is no doubt a good industry as it helps to remove the evil habit of drinking fermented palm juice. The museum located at the entrance gives a clear cut idea of the marvellous work undertaken by the all India Village Industries Association for rural re-construction.

In the evening we visited the Gau-Seva Charmalaya, a tannery at Wardha. The flesh of dead animals is used for manure, the bone for bone meal and the hide for various uses in the tannery. The quality of shoes, slippers, *chappals*, purses and leather attaches manufactured at this tannery, is fine. The material is durable and the prices are moderate. The simplicity in manufacturing products of various designs, and the general organisation of the tannery deserves appreciation.

Jalgaon:—We reached Jalgaon on the 3rd of January, and went to see one of the best ancient marvels in Indian history, the Ajanta caves. The beautiful stone carving, the lovely painting on the walls and the appealing design of caves give a clear indication of the wonderful art possessed by ancient Buddhist monks, who spent days and nights to create this masterpiece of stone-carving and painting.

Nasik:—Next day we arrived at Nasik Road and visited the Government Central Distillery and the vineyards of Nasik. The distillery manufactures liquors both from *mahwa* (Bassia Latifolia) and *gur*.

Karjat:—On January 5, 1939, we reached Karjat, which is the centre of rice breading for the Bombay Presidency.

Kolamba 42, 79, 184 and 226 have been found to be the best varieties of rice in different parts of the Bombay Presidency.

Poona: On the 6th and 7th of January we spent our time in seeing the various departments of the Agricultural College, Poona. There is a crop museum in the college where crops and vegetables of all kinds are grown. The students are taken around for identification of these crops. *Chaudhary* or the four-edged bean was something new for us. Wheat No. 808 Bansipali has shown very promising results for rust resistance and high yield. It is a cross between Bansi and Khapli, or spelt wheat, which is never attacked by rust. Besides, a number of crops, *e. g.* cotton, wheat, *jowar*, tobacco, fodder crops and vegetables, *suran* or Elephant's foot, is raised; and the cultivation of betel vine carried on.

Modi Bagh is a garden having different kinds and varieties of fruits as well as flowers. Alphons mango is a well-known variety. Mulberry is the windbrake used in this garden. The Basrai variety of banana has been found to be the best in growth, yield and fruit flavour. It has a stunted growth, providing some resistance to wind, and yields about 200 fruits per bunch. 'It has been noticed that grapes require a natural live support. For this purpose *pangara* (Erythyra indica) has been found to be well suited. Santara and *mosambi* trees are given a root exposure for one month. The results obtained have been reported to be very promising.

After seeing the college dariy and the departments of plant pathology, entomology, agricultural economics, agricultural engineering, herbarium, soil physics laboratory, and the chemistry laboratory, some of us visited the Government Central Poultry Farm.

Next day all of us made a trip to the Ganeshkhind Fruit Experiment Station at Kirkee. The fruit museum, cold storage room, the bee-keeping enclosure and the experiments conducted at the Ganeshkhind garden are worth seeing. The experiments carried on are mostly varietal and manurial. The following fruit varieties have shown

the best results : Alphonso mango, Lucknow 49 guava, Basrai banana, G.B. No. 1 pomegranate, Washington papaya, and Bhakri Nasik grapes.

An orchard heater has been devised at the garden. It requires one gallon of crude oil as fuel for four hours. It can raise the temperature by 6 to 10°F; and 30 heaters are required for an acre.

In the afternoon we went to see the Meteorological Department of the Government of India at Poona, which is the centre for 300 observatories scattered all over India. All sorts of meteorological observations are recorded every morning and evening.

Bombay :—On the 8th of January we reached Bombay, one of the biggest cities of India. The same day we made a trip to the Elephanta Caves in a steamer. The restless waves of the Arabian sea, the lively sight of the Alexandra Docks, full of ships, steamers and cargoes, and the beautiful scenery around, made the journey a pleasant one. The description of Elephanta Caves is not at all worth mentioning to a person who has seen the marvellous Ajanta Caves.

Next day we went to see the Veterinary College and the Haffkine Institute of Bombay which has got a biochemical laboratory for the preparation of different kinds of vaccine. On the 10th of January we visited the Technological laboratory of the Indian Central Cotton Committee. This laboratory has an up-to-date equipment for testing the various qualities of cotton yarn, for example, the strength and the fineness of fibre. We went to see the Royal Institute of Sciences as well.

On January 11, we paid a visit to the Kandivili Farm of Bombay. This dairy farm was originally meant for the protection of discarded cows and buffaloes, but today it has risen to the status of a good dairy and a cattle-breeding station, being financed by the Government of Bombay.

It was really a compulsion that made us leave the magnificent city of Bombay. The charming scenes of natural beauty, the lovely sea-shore, the beautiful Malabar hills, the joyous Juhu beach, the attractive waves of the

Arabian Sea, the palatial buildings of Bombay, the busy streets, the tram and bus service, the evening view of Chowpati, the Apollo Bunder, the Gateway of India, the grandeur of Metro, Eros, and the Taj Mahal hotel are still fresh in our memories.

Surat:—On the 12th of January, we reached Surat and visited the Government Farm. A.L F. 1027 variety of cotton and Budh-perio 53 of *jowar* have given the best results on the farm. The average results for 5 years on 1027 A.L.F. cotton have shown the staple length to be 0·95″, ginning percentage 35·5%, seed weight 63·7 mgm, the yield 518lb. per acre, and the highest counts 315. This variety of cotton is a selection from a cross between Ghogari and Kumpta. An experiment on the spacing of cotton, has shown that a distance of 6 feet between rows, 2 feet between plants and a one foot strip of *dhaincha* (*Sesbania aculeata*) a green manuring crop, has given the best yield: as much as 17 per cent. over the control. The effect of green manure has been studied as follows:—1st year green manure, 2nd year cotton, 3rd year jowar, 4th year cotton, 5th year jowar, and 6th year cotton. This experiment has resulted in an increase of 122% more seed cotton and an addition of 33,000 lb. of green manure per acre. The Plant Breeding Section of this farm is experimenting on the effect of "Colchicine" solution on cotton in order to get the number of chromosomes doubled.

Cotton boll-worm has been the most injurious pest on cotton. In order to attack this problem, a Research scheme was laid down by the Department of Entomology in 1923 for the control of cotton boll-worm. The results obtained have been very successful. The prohibition of the planting of *bhindi* or okra (lady's finger) near cotton field, and the total uprooting of stubbles were the control measures recommended. A plant-puller has also been devised for uprooting the stubbles. Its efficiency has been noted by an increase of 25% in the yield of cotton.

Kosamba:—In the evening of January 12, we reached Kosamba, and the next morning we went to see the Rural Reconstruction Centre of the Baroda State.

The excellent supervision of Mr. Souri has no doubt created a marvellous example of the degree of success, to which rural uplift work can be carried on in Indian villages. The work was started in 1932, to affect an all round improvement in village life. At present there are 35 villages included in the scheme, within a radius of 10 miles. The population is 30,000 and the different activities of the department include the Economic, Health and Cultural advancement in village life.

There has been a remarkable change in the life of every villager at Kosamba. In every house you will find a manure pit, a vegetable garden, few graded birds for poultry farming, some fruit trees, improved animals, and a bore-hole latrine. The industries prevalent among the womenfolk and village girls include spinning, weaving, bed-tape making, needle-work, golden lace work and other attractive handicrafts. The centre maintains a school for educating the boys, girls and adults of the neighbouring villages. It gave us real pleasure to walk through neat and clean villages, coming across our fellow countrymen—the cultivators, who seemed to be enjoying a better and happier life under improved conditions of health, economy and culture.

Baroda:—On the 14th of January, we had an interview with His Excellency the Dewan of Baroda, and visited the State Model Farm, which is advocating improved methods of crop-farming, poultry farming, compost-making, horticulture, electro-culture and fruit preservation. The Department of Horticulture recommends a Honeydew variety of papaya, Alphonso mangoes, Basrai banana, and Coimbatore figs. We saw a new variety of tomato known as "Oxhead". The maximum weight of its fruit has been found to be 87 tolas. The fruit preservation department is manufacturing jams, jellies, pickles, chutneys, syrups, vinegar, canned fruits and aerated lime water, with which we were entertained and enjoyed the fine flavour. The Engineering Department has designed a Gandhi Allan Hoe costing Rs. 11 per set for purposes of interculture, harrowing and ridging.

In the afternoon we saw the Durbar Hall, and every nook and corner of the magnificient, Laxmi Villas, one of the best palaces of His Highness the Maharaja of Baroda. We visited the Palace Dairy and the Zoological Gardens also.

Anand:—On the 15th of January, we reached Anand and met Mr. Matson, the learned manager of Polson Model Dairy. The Polson Dairy at Anand is unique in two respects. Firstly, it handles about 1½ lacs lb. of milk every day, yet having not even a single dairy animal. Secondly, it is the only factory in India which is manufacturing and exporting super fine casein to foreign countries. The location of this dairy is really fine, for it is not a matter of joke to collect 150,000 lbs. of milk for butter-making every day from neighbouring villages. The milk sellers are paid the price for milk not by weight but according to the percentage of butter fat, tested scientifically. Hence, there can be no adulteration of milk.

Ahmedabad:—At night we left for Ahmedabad and visited the Chharodi Cattle Breeding Farm on the 16th of January, 1939. This farm was started in 1899 by Lord Northcote, the Governor of Bombay, who made a personal donation of Rs. 24,000. The following breeds were tried: Kankrej, Wadhiar, Tharparkar and Marwari. Kankrej proved to be the best dual purpose breed for the cultivators.

In the afternoon we went to see the Calico Mill which is one of the biggest among the 97 cotton mills at Ahmedabad. There are 5,000 workers in this mill.

Indore:—On the 17th of January, we reached Indore and stayed at the Indore Christian College. Next morning we visited the Institute of Plant Industry at Indore. It has been found that Harrison's Special Tabacco can be grown without irrigation. An easy method for tobacco curing has been recommended for the villagers. As the mid rib takes the longer time to dry, it is first mechanically pressed by wooden rollers and then dried in the sun, under grass cover. Then it is conditioned by slight fermentation in a humid place for the development of aroma. In the end the leaves

are ironed by hand, put under stone-pressure and sold in the market.

Co421 has been found to be the best variety of sugarcane for *gur* and sugar manufacture, and Co 490 for chewing type. The ridge system or the modified Java method is employed for sugarcane cultivation. The Indore method of compost making is well-known and highly recommended by the authorities. A detailed description of the method has been published in Bulletin No. 2 of 1934. For the manufacture of *gur*, the "Mc Glashan" furnace has been found to be the most suitable type. It requires very little technique and can be easily adopted by the ordinary farmers. The advantages of this furnace have been discussed fully in Bulletin No. VIII of 1921, published by the Department of Agriculture, Central Provinces.

Kans (*Saccharum spontaneum*) plough is very efficient for uprooting *kans* and other deep-rooted weeds. The seeding spout is adjusted by a combination of bamboo pieces so as to sow 2, 3 or 4 seeds at a time. The Plant Breeding Department is doing many experiments with various crops by hybridization and selection. A selection from malvi cotton has resulted in better varieties, *e.g.* Malvi 1, 9, 13 and several new selections M. U. 4 (*e. g.* Malvi Upland 4) spins 30 counts and M. U. 8A spins 40 but the yield is less. Linseed I. S. 11 (*e.g.* Indore selection 11) has given the best results. It is white in colour and has an oil content of 45%. *Jowar* No. 3 is the best in yield and the colour of grain is ivory white, whereas the next in yield is No. 9, which has the most attractive appearance.

The Chemical Laboratory is carrying on experiments on fertilizer responses, salt content determination, and analysis of soil samples. After seeing the various departments we had an interesting and useful lecture on "Plant Breeding" by Mr. Ramiah. In the evening we were invited for tea by Dr. Mrs. Bryce who was kind enough to introduce us to the office-bearers and some of the members

(*Continued on page 93*)

A Book Review

Secretion of Milk. BY DWIGHT L. ESPE. *Assistant Professor in Dairy Husbandry at Iowa State College.* Ames, Iowa, U.S.A. Collegiate Press, Inc. Price $3·00 or Rs. 9.

This book is not intended to fully satisfy the practical dairyman or the research student, but is rather "to steer a middle course". Six hundred and ninety-five references, mostly in English, are cited, indicating an extremely comprehensive text, yet technical terms are avoided so far as possible.

The subject material is divided into three parts. Part one is made up of the chapters on the phylogenetic development of the mammary gland and the anatomy of the udder; part two of those on the theory of milk secretion, factors affecting the amount and composition of milk, nervous control, hormonal control and miscellaneous factors related to milk secretion; finally, part three deals with the effect of feed on the amount and composition of milk.

It is the opinion of the reviewer that a finer method of presentation than the author has used would be difficult to find. In this book the foundation knowledge of the function of the mammary gland is laid in a study of its anatomy. The theory of milk secretion follows. Immediately after this comes an extended and detailed consideration of those factors affecting the amount and composition of the milk. Next after discussing the nervous, hormonal and miscellaneous factors, which add confirmation to the latter discussion, the whole is again discussed, one might say, from yet another point of view, that is, the effect on the amount and composition of the milk of each of the various food groups. In other words, the foundation is firmly laid; the structure is then designed and constructed. It is then exposed to the disintegrating factors it was designed to resist; it proves sound and firm.

The technical terms used are not such as would prevent the person unfamiliar with them from finding the book of great value. The information contained in the book, together with the bibliography, makes it a text of inestimable value to the more technically trained worker in milk production and veterinary medicine.

J. N. W.

B.Sc. (Ag.) Students on Tour

(Continued from page 91).

of the you-and-I Brotherhood, an organisation of the students of Indore Christian College. They gave us a vivid description of their village uplift work at Indore and were also interested to hear from us the various activities of the Social Service League and the Students' Christian Movement of our Institute.

The last day of our trip was very interesting. On the 20th of January, we had a picnic at Patalpani, a waterfall gushing forth, amidst the beautiful hills of Khandwa district. The railway journey was very attractive throughout. The lovely patches of the Vindhyas, the Satpuras and the Western Ghats covered with tall, green forest trees provided a remarkable sight. The large number of tunnels and the zigzag railway journey, the hills, the fine valleys, the natural water sources, the beautiful falls, the coloured pieces of rocks, and the wonderful scenes of natural beauty held us spell-bound all along

U. P. DEPARTMENT OF AGRICULTURE MONTHLY AGRICULTURAL REPORT

FOR DECEMBER, 1938

I—Season.—There was practically no rain throughout the month all over the province and it is required urgently everywhere, especially in the western districts.

II—Agricultural Operations.—Irrigation of 'rabi' crops, crushing of sugarcane and preparation of land for extra or "zaid" crops and sugarcane are in progress.

III—Standing Crops and IV—Prospects of the Harvest.—The growth of the 'rabi' corps is mostly retarded for want of rain in unirrigated areas and if there is no rain in the near future, it is likely that they may fail. The outturn of sugarcane is estimated at about 65 per cent. of the normal.

V—Damage to Crops.—No serious damage to crops has been reported except to the crops in unirrigated areas. While there was enough moisture in most cases for the crop to germinate, there is not enough to support subsequent growth.

VI—Agricultural Stock.—The condition of the agricultural stock is generally satisfactory. There has been a general decline in outbreaks of rinderpest and haemorrhagic septicaemia. There is a slight increase in foot and mouth disease. The following figures of cattle mortality furnished by the Director of Veterinary Services, United Provinces, vouch for this statement:

Disease	November, 1938		December, 1938	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	2,971	1,618	2,599	1,299
Foot and mouth ..	3,675	30	4,574	138
Haemorrhagic septicaemia	580	461	137	110

VII—Pastures and Fodder.—Fodder and water are sufficient everywhere except in a few districts where fodder scarcity is reported.

VIII—Trade and Prices.—The prices of food grains show a general tendency to rise. The following figures compared the average retail prices of the chief food grains in rupees per maund at the end of the month with those of the preceding month.

	End of November, 1938	End of December, 1938
Wheat	2·690	2·969
Barley	2·103	2·277
Gram	2·711	3·043
Rice	2·673	3·761
Arhar dal	4·807	4·866

IX—Health and Labour in Rural Areas.—The condition of agricultural and labouring classes is generally satisfactory. Cholera and plague are reported from a few places.

For January, 1939

I—Season.—There was general rainfall during the second-half of the month, but it was light and below the normal in almost all the districts. More rain is required everywhere for the *rabi* crops.

II—Agricultural Operations.—Agricultural operations are up-to-date. Preparation of land for sowing sugarcane and extra crops is in progress. Irrigation of *rabi* and pressing of sugarcane continue.

III—Standing Crops and IV—Prospectus of the harvest.—The condition of the standing crops is satisfactory in irrigated areas. The recent rains benefited the *rabi* in unirrigated lands. Prospects are on the whole favourable.

V—Damage to Crops.—Some damage to crops by hails is reported from certain districts in the Allahabad, Jhansi, Lucknow and Fyzabad Divisions.

VI—Agricultural stock.—The condition of the agricultural stock is reported to be generally satisfactory. The following figures furnished by the Director of Veterinary Services, United Provinces, show cattle mortality as compared with the last month :

	December, 1938		January, 1939	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	2,599	1,299	3,036	1,564
Foot and mouth	4,574	138	9,367	106
Haemorrhagic	137	110	105	95
Septicaemia	..	..		..

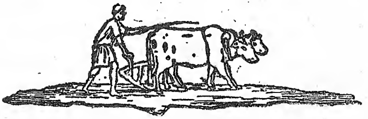
VII—Pasturage and fodder.—Fodder and water are reported to be sufficient everywhere except in some western districts where fodder is scarce.

VIII—Trade and prices.—The prices of the chief food grains have generally risen to some extent. The following figures compare the average retail prices of chief food grains in rupees per maund at the end of the month with those of the preceding month :

	End of December, 1938	End of January, 1939
Wheat	2·969	3·187
Barley	2·277	2·393
Gram	3·043	3·283
Rice	3·761	3·895
Arhar dal	4·866	5·157

IX—Health and labour in rural areas.—The condition of the labouring and agricultural classes is satisfactory. Plague and cholera are reported from a few districts.

THE
ALLAHABAD FARMER



VOL. XIII] MAY, 1939 [No. 3.

An Editorial.

The Value of Agricultural Fairs

For several years now the Allahabad Agricultural Institute has been holding an annual fair for the farmers of the Allahabad district. This fair has been growing every year not only in its popularity but also, we are sure, in its effectiveness to carry the message of better living and better farming to the farmers who frequent the fair during the three or four days that the fair was being held. The new farm implements, the improved seeds, the better cattle, the model village, all these and many other exhibits must have impressed upon the villager the need for better living for himself and his family. The fair was so organized by the staff and students of the Institute that not only the exhibits speak for themselves, but the demonstrators also added a great deal to the knowledge and understanding of the villagers of those things that were shown to them. This fair has also another very great value and that is this, that the students, one and all, who took part in organizing and demonstrating, learned a very valuable lesson as to how to impart their knowledge of good farming to those who came to them to learn.

A great deal has been learned during the last few years about better methods of farming. But these things have not

yet been adopted by most farmers. We believe therefore, that these fairs have a great value and should be widely adopted and run by men who know how such fairs should be run.

It is for this reason that we have decided to put out a special issue of THE FARMER on the last Farmer's Fair held at the Allahabad Agricultural Institute, with the hope that the experience that we have learned through these years in running the Fair may be of value to others who may wish to do the same in other parts of India.

* * * *

Photo-Nitrification in Soils

B. N. Singh and K. M. Nair of the Benares Hindu University in a very interesting article entitled "Is sunlight a factor in nitrogen transformation in Soil?" which appeared in a recent issue of SOIL SCIENCE, a Journal published in America, showed that the accumulation of nitrite was due to both photochemical and biological reactions, but that the oxidation of nitrite to nitrate was due exclusively to biological agency. The conclusion they thus reached as a result of their very careful experiments is that biological reactions are largely responsible for the process of ammonification and nitrification in soil though nitrite is formed also as a result of photochemical action.

We draw the attention of our readers to this as recently there has been set forth a theory in this country that agencies other than the soil microflora are concerned in the process of ammonification and nitrification in soils.

* * * *

"The Christian Church and Rural India"

This is the title of a book written by Bishop George Jay Lapp, and published by the Y.M.C.A. Publishing House, 5 Russell Street Calcutta, which has been sent to us for review.

We have read the book with interest and would recommend it to all those who are interested in the building up of Rural India. In this book we have presented to us the needs of the country-side and the way by which the Christian Church in this country has tried to meet those needs.

Leaders of the Christian Church have tried to evolve new methods of rural elementary education in various parts of

India, the most notable of which is probably the Moga experiment in the Punjab; they have tried to tackle the agricultural and rural problems of the country by instituting schools and demonstration centres in various parts of the country; they have led the way in matters of adult education, and in the teaching of girls; in fact they have tackled the rural problem from various angles wherever they see the greatest need for help.

But the methods adopted have been sometimes haphazard, that is they have not been well organized. There is therefore a need for a centralized co-ordinated effort such as will make its impact upon the whole village life.

This seems to us to be the trend of Bishop Lapp's thought with which we also agree.

* * * *

Animal Breeding in India.

"Animal breeding is behind plant breeding in all parts of the world in the application of Mendelism to practical problems. Animal breeding is farther behind plant breeding in India than in other countries. There is a noticeable reluctance on the part of animal breeders in India to seek any help from the science of genetics. The general scepticism regarding the application of Mendelism to cattle breeding is born of ignorance, not of knowledge. In sending his students up for their examinations for the Bachelor of Science degree in agriculture from the Allahabad University, the senior author has experienced having an external examiner grade as wrong the entire class who stated confidently their belief that inheritance in cattle is in a Mendelian manner. Also, it has been called to our attention that university students in at least one other agricultural college in India are being taught that Mendelism does not apply to cattle. One Government official even informed the senior author that data had been obtained proving that Mendelism does not apply to milk production. Mendelism, it seems, has been accepted only in plant breeding. One of the attractive features of Mendelism is that it applies to all species of plants or animals that have ever been studied from this view point."

(Schneider and Rathore in "The Indian Journal of Veterinary Science and Animal Husbandry," Vol. IX, Part I.)

THE FARMERS' FAIR

ALLAHABAD AGRICULTURE INSTITUTE

By

K. J. Devadanam, M.Sc. (N.U.), M.Sc. (U. of M.) U.S.A.,

Department of Animal Husbandry and Dairying.

One of the most effective methods of changing the outlook on life and helping to create a new attitude toward the improvement of land, live-stock and personal pride, is the Farmers' Fair held by the Agricultural Institute.

This Farmers' Fair which is held each spring for the benefit of the farmers of the surrounding country, and others interested in improved agriculture, started on Thursday, 23rd February, and lasted till Saturday, the 25th February, 1939. Exhibits, demonstrations, and various competitions are the chief features of the fair. The students of the Institute (who come from all over India—from Kashmir to Travancore and Assam, and even Persia, Mesopotamia and the Fiji Islands) are given an opportunity to exhibit live-stock, poultry, field crops, vegetables and fruits, and demonstrate their skill in judging cattle, showmanship, milking, ploughing etc. This year the women students of the newly started Home-Making Department also exhibited different sections of their work such as needlework, handicrafts, cakes and pastries, and demonstrated the model home with proper ventilation, sleeping and living rooms, kitchen, borehole latrine, bathroom and the kitchen garden. Particular attention was given to the necessity to keep the home free from smoke by the use of a chimney and improved *chula* (stove) and to make use of the kitchen and bathroom water in the home garden.

The Social Service League of the Institute demonstrated a co-operative model farm, mat-making, *sutli* thread making, cotton spinning by *charkha*, and flour making. Some of the very interesting exhibits were from village

Muhabbatganj Industrial School. The Social Service League is an organization which is under the student government. It conducts village schools in three different villages. The chief aim of this League is to render help in building educational, recreational, social and moral programmes for the enrichment of village life.

The rural reconstruction centre exhibits came from over a dozen villages. Here there were over 400 colourful exhibits, such as hand-made baskets, trays, bags, quilts, crochet and fancy needle work, useful garments and *charpais* (beds) and numerous other handicrafts which were prepared by the village women and girls under the direction of the women students of the home-making department of the Institute. Mrs. Mason Vaugh has been encouraging and directing these cottage industries among village women and children for the last ten years.

Some of the most spectacular events during the fair were the activities of the Animal Husbandry and Dairying Department. These consisted of contests for Student Cattle Judging, Student Showmanship, Institute *Gwalas* (dairymen) judging, Village Gwalas Cattle Judging, Village Gwalas Milking, Village Cattle Show, Ploughing by students and village farmers. All these contests were run in accordance with the rules and regulations of the All India Cattle Show.

The outstanding feature of this year was the keen interest shown by the surrounding villagers in their enthusiasm to exhibit their numerous agricultural and village industrial products.

In his opening address, Mr. A. N. Shukla, the District Rural Development Officer said that this sort of fair was the true vehicle to interpret scientific agriculture to the rural population of India in promoting and extending the three-fold policy of the rural reconstruction project namely, the economic, social, and educational reconstruction of village life. Dr. Amarnatha Jha, Vice-Chancellor of the Allahabad University (of which the Institute is the agricultural department) not only showed keen interest in the fair but also

gave a generous gift to promote the work of the Social Service League of the Institute. Mr. Bishan Man Singh, Zamindar and Rais of Fatehpur was greatly impressed with the possibilities of the Farmers' Fair. In his speech he stressed the three main duties of the cultivator: first his duty toward improvement of his land; second the duty toward the improvement of his live-stock; and third his duty to create and extend a better relationship toward his fellowmen. Pandit Moolchand Malaviya, Secretary of the Allahabad Agricultural Association, said that such a fair was an object lesson to the rural farmer.

This fair was visited by several hundred people, consisting of villagers, zamindars and *kisans,* rural development workers, students and people generally interested in scientific and improved agriculture. Among them was the Hon'ble Mrs. V. L. Pandit, Minister of Local-Self Government, United Provinces, who visited the fair on Saturday, February 25th. The officiating Principal, Mr. W. B. Hayes, and Mr. Mason Vaugh, the Institute Engineer and Chairman of the Farmers' Fair Committee, and the student representatives received Mrs. Pandit and conducted a tour through the fair for her inspection. She was much interested in the stall exhibited by the lady students of the Home-Making Department of the Institute. In this stall under the able leadership of Mrs. E. F. Vestal, the women students were given the opportunity of displaying their skill in cooking and baking Indian and European refreshments such as sweets, cakes, biscuits, potato chips, (ice-cream, chocolate milk, *rasogulas* prepared by students of the dairy department), grape-fruit, and fruit-juices (prepared by the students of the horticultural department). The Home-Making course for women was opened in 1936 by Mrs. Sam Higginbottom. The aim of this course is to develope more efficient and gracious wives and mothers and to assist in preparing young women to teach Domestic Science or Home Economics, a course in girls' high schools requiring more teachers than are now available.

Mrs. Pandit was then shown the exhibits of the agronomy department consisting of field crops, vegetables and fruits. This year in this department there were over 500

entries, out of which 377 were classified exhibits, representing the work of the students and over 50 surrounding villages. She then visited the Kushrubagh Garden exhibits, the horticultural exhibits where the fruit products, jams, jellies, chutnies, (pickles) etc. were displayed and demonstrated. She also saw the Social Service League and was especially interested in the village rural reconstruction work under the management of Mrs. Mason Vaugh. She finally saw the poultry section and showed keen interest in the exhibits of white leghorns and the eggs which the Institute sells to the surrounding villagers to improve their birds.

Every evening the farmers of the surrounding villages and visitors had the unique opportunity of seeing talking movies of farm machinery and implements and showing all operations on the farm with Farmall Tractors, International Mowers and a complete cycle of the growth and harvest of rice. These talkies were shown by the kind courtesy of the Bombay Agents of the International Harvester Company, Chicago.

On the closing day of the fair over a thousand villagers and many citizens of Allahabad saw a play by the Engineering Department of the Institute, showing the use and advantages of improved agricultural implements for the village farmer. The fair ended with the distribution of numerous prizes (consisting of cups, shields, medals, certificates, and cash prizes) to the winners by Mrs. N. R. Dhar, wife of the Assistant Director of Public Instruction, United Provinces.

Let us recognize more fully that the soil is one of God's richest gifts to mankind—meant to be used with a sense of stewardship, to be left as good or better than we found it, for the well-being of future generations. Mankind generally has sinned against God in the destructive use of the land. The welfare of the rural community is dependent on it. Man and land deteriorate together, and with them his institutions.

—J. H. Reisner.

HORTICULTURAL EXHIBITS

By

Mohammad Hamza Hashmi

Student B.Sc. (Ag.) Allahabad.

The long awaited days of February came, hurried preparations were over and the stage was set for the Farmers' Fair. It was the 23rd of February, 1939. Every member of the Institute was very busy, exhibits poured in from far and near and the stalls were artistically decorated. In short, every corner of the Engineering Building was humming with life and hundreds of men, women and children were attracted by the exhibition.

Entering the Horticultural Exhibits section, every visitor at first sight caught a glimpse of the attractive grape fruit arranged under different names, such as Excelsior, Duncan and Marsh Seedless. At the other end of the same table were found the lemon (C. limon), Rangpur lime (C. limonia), sweet oranges (C. sinensis), rough lemon or jamburi, (C. jambiri), calomondin or *hazara* (C. microcarpa), *khatta* (C. karna), *kamrakh* (Averrhoa carambola), and basketfuls of grapefruit (C. paradisi). One of the students appointed as demonstrator did his duty by explaining the technique of propagating fruit trees by inarching, and budding. Small budded and grafted trees were also exhibited.

The actual working of the Horticultural Products section of the Institute was to be seen each afternoon. On the first day of the Fair, the apparatus used in manufacturing fruit products was shown to the visitors and tomato catsup was made. On the second day, the method of preparing cape gooseberry jam was demonstrated. On the third day, that is the last day of the Fair, principles of jelly-making were explained by showing the actual preparation of tomato jelly.

Throughout the fair, different kinds of jams, jellies, marmalades, chutneys, preserves, pickles, fruit juices and

canned fruits were sold. The working of the pressure cooker, the special construction of jelly jars, and the necessary precautions required in the manufacture of fruit products were explained to the visitors. Every possible effort was made to make the demonstration a real success by explaining the main principles of fruit preservation in English and Hindustani.

The attractive colour and high quality of fruit products as well as the fine appearance of grapefruit found an encouraging market, and the total sales were quite satisfactory. Some of the fruit products prepared by the Pomology students of the fourth year class were also exhibited. One evening Mr. Dayal Chand delivered an interesting and useful lecture on "The Importance of Fruit-growing in India." In addition to all these activities, a model orchard was maintained and a Horticultural Bar was running on all three days. It was one of the greatest centres of attraction during the Fair and the following preparations were served grapefruit, lemon squash, lime juice and syrups.

Exhibits from the Government Gardens, Allahabad, formed another important feature of the Fair. Different kinds of garden tools and implements, some of the insecticides and fungicides, the methods of graftage and the process of packing plants were shown. Besides these a vegetable *dali* was exhibited, several useful charts on gardening were hung on the walls and the horticultural bulletins published by the Department of Agriculture, United Provinces, were also sold. The co-operation of Mr. V. E. Morgan, the Superintendent of Government Gardens, Allahabad, during the Farmers' Fair was greatly appreciated.

"Any programme for the village must meet the needs of the men, women and children of the village. The home is the basic unit of any society or civilization. As the home is, so will the civilization be."

—SAM HIGGINBOTTOM.

A GLIMPSE OF THE PLANT DISEASES SEEN AT THE FARMERS' FAIR.

By Dr. E. F. Vestal

A Farmers' Fair should cover all phases of Agriculture and no fair could be said to be complete unless it included something of the plant diseases which so often are the cause of the crop failure. Plant diseases have been known as long as the crops themselves and as man has increased the cultivation of the various crops with the passing of time, so the diseases too have increased both in number and intensity. Today there is no crop which escapes the attack of at least one major disease.

The Farmers' Fair at the Allahabad Agricultural Institute was held during the *rabi* crop season and so of course emphasized the crop diseases of that season, perhaps the most important disease of the *rabi* crop season, and, certainly of the time at which the fair was being held, was the rust of cereals. In this connection we should say, "rusts," because there are at least three which are found upon wheat, *i. e.* brown, yellow and black.

Rusts have been recognized by the growers of wheat since the first records of its production were made. As wheat was carried over the face of the globe by the wandering tribes of men the rusts where also carried in the same manner. Although one of the oldest known diseases of cereals it is today one of the worst and one over which we have very little control. Our only progress toward freedom from the rusts lies in the direction of resistant varieties. One of the exhibits of the fair was a chart upon which the comparative amounts of rust (black stem) on eight varieties of wheat were histographically illustrated. At the same time the eight varieties of wheat were shown in pots, each variety being chosen to represent the amount of rust illustrated on the histogram of the eight, *i. e.* Pusa 4, Pusa 111, Pusa 165, Pusa 52, Pusa 54, Punjab 8-A, Cawnpore 13 and local, the first three showed the greatest resistance.

In order to determine the degree of resistance of each variety to the different rusts, they were sown in randomized plots in the field and the rust and yield data analyzed for significance. This is the third year that the experiment has been going on and it is hoped that by the time the crop data has been analyzed this year, it will be possible to make a more or less definite statement regarding the adaptability of the various varieties for this area of the U. P.

But rusts are not the only diseases which are important among the farm crops grown on the Institute farm. On the citrus fruits will be found a bacterial disease known as "Canker" which is nearly as serious on some of the citrus fruits as the rusts are upon the cereals. This is especially true of the limes and grape fruit, the market value of which is often seriously affected if not destroyed. At present sprays, such as bordeaux mixture, are the only suggested control measures, but, because of the cost of the equipment and material such measures cannot be recommended for the average Indian conditions.

Among the members of the potato family, *i. e.* potato, tomato, chillies, tobacco and egg plant, are found many diseases. Perhaps the most serious and widespread is that of the virus diseases, commonly known as "Mosaic." This is a disease of the chlorophyll and causes various types of chlorosis, mottling and deforming of stems, leaves and fruits. Transmitted from plant to plant by insects, much as malaria is transmitted among people by the mosquito, it takes various forms and appears to have a wide range of host plants. It is considered by some that the mosaics which are found among the members of the potato family may correspond roughly to the different forms of influenza among people recognized by physicians. At this time the only control which we know lies either in the control of the insect pests which transmit the virus or in breeding resistant varieties. In neither direction has any real progress been made. Typical examples of the diseased and healthy plants were displayed at the fair.

(*Continued on page* 109)

HEALTH TEACHING AT THE FARMERS' FAIR

BY MABELL S. HAYES, M. D.

Some authorities state that three-fourths of the deaths that occur in India are caused by dieases which can be, to a very large extent, or altogether, prevented. Tuberculosis and malaria are without doubt the two most common diseases in this part of India. All of India is uniting just now in an anti-tuberculosis campaign. One of the conspicuous parts of our exhibit is a series of posters made by the Indian Red Cross Society. Six of these show the common methods by which the tuberculosis bacillus spreads from one person to another. The other six show health habits which protect a person from infection by these germs. Other posters emphasized the dangers of dirty surroundings where pools of water can collect in which mosquitoes can breed and menace the health by spreading malaria. One poster gave a picture of the appearance of healthy blood alongside of a picture of a man ploughing. Then follows a series of pictures in which he is bitten by a mosquito, falls ill with fever and is treated by a doctor. There are also insects showing the appearance of the blood in each stage, the malarial parasite destroying the red blood cells during the fever, the resulting anaemia, and the return to normal blood after treatment.

A few very attractive posters have been made up to show the advantages of eating fresh fruit and vegetables. But the main emphasis is put on the advantages of such diets in childhood and for women during pregnancy. A special effort is made to bring to the public the facts that everyone should know about care of a mother during delivery and the lying-in period. We believe that men will begin to demand for their women folk the proper care when they come to understand the terrific mortality which results from careless and unclean methods. A set of sixteen posters in Hindi explains the important points in detail. But what about the presentation of these facts to the illiterate villagers? For their benefit a demonstration was set up show-

ing a clean delivery room and a dirty room. In the clean room was a simple but clean arrangement including only the necessities, a clean sheet on the *charpai*, a clean basin, a bottle of antiseptic, a pair of scissors and a pan in which they could be boiled. In the dirty room were the things which one often finds in the village houses today, a dirty ragged bed cover, rags which have been lying on the floor, a pot of ashes and burning coals, and a sickle which had not been cleaned since it was used to cut the harvest in the fields. As long as the sickle is used to cut the baby's cord there is danger of tetanus killing the baby, and as long as the mother uses such filthy rags there is danger of septic fever or tetanus taking her life. We believe that these ideas will be retained in the minds of those who visited the exhibitions, and bear fruit for the betterment of India.

A Glimpse of the Plant Diseases Seen at the Farmers' Fair

(*Continued from page* 107)

There are many other diseases found among the crop plants but the space allotted to this discussion will not permit the treatment of all of them, even if it should be considered desirable to test the patience of the public by so doing. But such diseases as early blight of potatoes, downy mildew of *bajra*, root rots of various crops and the many leaf spots are being studied at the Institute with a view toward control in the future. It is generally considered that the most promising outlook for such control lies in the resistant varieties. If all of the farmers of the United Provinces will keep a look out for exceptional plants and collect seed from them, such seed may well prove to be the very stock needed from which to select for disease resistance. If those finding the exceptional plants do not feel that they are prepared to grow and study the plants themselves the Institute will be happy to receive the seed and make the tests where it is possible to secure comparative yield, as well as disease resistance, data.

REPORT OF THE RURAL HANDICRAFTS SECTION OF THE FARMERS' FAIR, 1939.

BY CLARA P. VAUGH

This is the fifth year for this section and each year has seen a real improvement both as to quality and quantity of work exhibited so that we feel it has been a most worthwhile work in developing the latent talents of our village women. Heretofore we have been contented with individual competitions but this year a new factor entered when we decided to give an incentive to the individual to mean something to her village. If India is to grow she must make her village men and women conscious of their social obligations to a larger group than the family. With this in mind we sent out word that not only would we have individual prizes but that the village that had the most exhibitors, the largest number of exhibits, and the best, would be given a prize that could be kept for one year. Not too much enthusiasm was aroused but some group consciousness was achieved and we believe that the right start has been made. Lady Haig and Vidya Lakshmi Pandit responded to our request for prize money. Lady Haig very kindly gave Rs. 50 for the purchase of handlooms for rug making for the first prize and Mrs. Pandit generously gave Rupees 20 for *charkhas* for the second prize. This amount of money was sufficient to buy 6 handlooms and six *charkhas* with a small surplus remaining for repairs of these looms and *charkhas* as the years go by. The village winning is to keep the prize for one year only with the idea that as many in the village as possible may profit by the possession of the looms and *charkhas* and a new impetus be given to the villagers. Those who had the most and best handwork from the village are allowed to keep the prizes in their own home for general use.

Not only are we grateful to the prize money givers but we are deeply indebted to Mr. A. N. Shukla for his very real co-operation in getting so many of the Rural Development Center organize s to bring exhibits from their circles. Last year out of six centers we had all six represented and this

year out of 24 we had 22 represented some coming from as far away as forty or more miles. Each circle leader was keenly interested in all the various phases of the fair and many left saying they intended to see what could be done to duplicate such a fair in their own circle of villages. Each circle or center represented from 2 to 8 or more villages so that we have a wide area of influence. Next year we shall be able to expect even a greater response and so it makes our own responsibility the greater. These men are coming to us for help as well as to give the best they have been able to get from their circle. If we have been of any service to them it will show in the response we get from them next year.

Again the large measure of success which our department had was due in large measure to the loyalty and enthusiasm of all of our very active committee and public thanks are especially due to Mr. Bapna and Mr. Borpujari for the unstinting and tireless efforts they both put forth.

Our committee was especially fortunate in getting Mrs. Probhu Bannerje, Secretary of our Municipal Industrial School Com., Mrs. Zutshi and Lady Drake Brockman as judges for the three competitions—inter-village, inter-circle, and the individual competitions. Below is the list of the qualifications etc. of these competitions.

For the Judging Committee of the Farmers' Fair, February 23, 24, 25, 1939.

There are three different competitions

First:—Village against village.

QUALIFICATIONS

1 There must be at least three exhibits of one thing *i. e.* 3 baskets or 3 knitting or 3 embroidery etc.

2 There must be at least 3 different types of work, *i. e.* knitting, embroidery, basketry, crochet, basket or some such type of hand work (rugs, hand spun wool, thread, rope, etc.) all by women only.

3 Articles must be of either aesthetic or utilitarian value. Such things as grass-made hookahs etc. are excluded

STANDARDS FOR JUDGING

1 Quality of work neatness, beauty, cleanline.

2 Number of kinds of exhibits (see 2 above).

3 Number of individual exhibitors.

Second:—Rural Reconstruction Center Competition Circle against Circle.

QUALIFICATIONS

1 Number of villages represented by each Circle.

2 Number of individuals exhibiting.

3 Types of work represented.

Third:—Individual Competitions of :

1 Basketry.

2 Knitting.

3 Embroidery.

4 Crochet.

5 Sewing.

Standards.

Beauty.
Utility.
Neatness.

The following is a summary of the statistics of our department.

Number of Rural Development Centers represented	22
" " villages represented	53
" " individuals represented	225
" " types of work-knitting, basketry, embroidery etc., etc. ..	53
" " exhibits of all types	390
" " prizes inter-circle first and second	2
inter-village " " "	2
inter-school " " "	2
" " individual prizes-special	6
" " " prizes for embroidery, sewing, basketry etc. ..	8

REPORT OF SOCIAL SERVICE LEAGUE STALL FARMER'S FAIR, AGRICULTURAL INSTITUTE ALLAHABAD

The Social Service League which is an organization of the students of the Allahabad Agricultural Institute demonstrated a co-operative model farm. It depicted a true picture of an improved diversified farm that is possible only if the villagers co-operate. This was praised by one and all because of its originality and its intrinsic value.

The League also demonstrated the work of three schools which are run under its auspices. The schools represented were:

1. Labourers' Night School.
2. Kharkoni Night School.
3. Muhabbatganj Village Night School.

Over and above these some exhibits of other schools which are not run by the Social Service League were also exhibited.

The students of the Muhabbatganj Village Industrial School demonstrated spinning, mat-making and *sutli* making daily.

Under the auspices of the League a drama was staged in *dehati* by the students of the night schools. The drama was about Sanitation, Evils of Smoking and Alcohol and Superstitious Methods of Control of Diseases.

On the last day some races were organized for the young schools boys of the villages, after which they were rewarded with some estables. A prize was given to Pannu Lal as the best student of the labourers' night school.

Pandit Amarnatha Jha, the Vice-Chancellor of the Allahabad University, was very much impressed by the activities of the League especially among the rural people.

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THE ENTOMOLOGY SECTION AT THE FARMERS' FAIR

By W. K. Wesley.

The Entomology section displayed the life histories of insects of economic importance such as rice grasshopper, rice bug, red cotton bug, dusky cotton bug, white ants, red pumpkin beetle, mosquito, til moth, sann hemp moth, potato moth, sugarcane top shoot borer, pink boll worm, green boll worms, lemon butterfly, etc.

The major crop pests and the stored grain pest were demonstrated separately.

Sericulture and lac culture was explained and the possibility of sericulture as one of the cottage industries was pointed out.

An attempt was also made to demonstrate the methods of control of harmful insects by natural methods and by the use of insecticides.

For the maximum benefit of the visitors the posters were written as far as possible in Hindi, Urdu and English.

A number of leaflets giving the general survey of insects, their life histories and the control methods were displayed on the bulletin board.

The whole demonstration was given by the students under the guidance of the entomologist.

(Continued from page 113)

He very kindly gave a generous donation of Rs. 50 to help the work of the League.

The League extends its hearty thanks to Mrs. Mason Vaugh, Miss Hariraj Kumari Singh, Messrs. S. C. Bhatnagar, Bhagwan Das, S. P. Sharma, S. R. Upadhaya, P. K. Sinha, V. K. Verma, J. P. Gupta, and the executive members of the League for their kind co-operation.

S. R. Barooah,
President,
Social Service League,
Agricultural Institute.

THE AGRONOMY DEPARTMENT IN THE ALLAHABAD FARMERS' FAIR

This Department had two or three main functions to perform during the Fair. These are: (1) the running of several ploughing contests on the fields of the Allahabad Agricultural Institute Farm, (2) the running of competitive exhibits of grain and crops produced in the Allahabad area, and (3) the exhibition of improved types of crop plants recommended by the Department. In addition the Department also demonstrated to the public the technique of carrying out certain experiments such as statistical methods of field experimentation, electroculture experiments, soil groups, etc.

In ploughing there were contests between the villagers themselves. The idea was to encourage the villagers in the use of improved ploughs recommended to the farmers of the district. Another ploughing contest was between students of agriculture. This latter was a new feature this year, and it is expected that students of other agricultural colleges will also send their representatives next year for this competition.

The most successful part of the exhibition in this section was the very great number of entries in the grain and crop contests. This has brought many samples of grain and crops which have done well in the district and which prove to be the best for the whole area, and we believe, better than those introduced from outside the province. It seems most of the local farmers have been very careful to keep from one generation to another the varieties of crops best suited to their locality. Here is therefore an opportunity for selection of the best that we already have in the area. With a little extension of this idea and with a little better organization a crop survey of the area can be made through such a fair.

The exhibition of the improved varieties of crops that have been tested in the Allahabad Agricultural Institute fields

(Continued on page 134)

FARMERS' FAIR, 1939

Cash Prizes awarded for Crops and Vegetables

REPORTED BY G. Q. VACHOO

No.	Names	Village	No.	Exhibits	Grade	Prize
						Rs. a.
1	Abdul Ghani ..	Janghirabad	340	Mustard ..	First	2 0
2	Sukh Dev ..	Karchchana	314	,, ..	Second	1 0
3	Bachu Lall ..	Chandopore	276	Linseed ..	First	2 0
4	Hirwa ..	Bharawan ..	326	,, ..	Second	1 0
5	Nawab Hussain ...	Gangia ..	133	Wheat ..	First	2 0
6	Abdul Ghani ..	Janghirabad	337	,, ..	Second	1 0
7	Punni Lall ..	Kharkauni .	19	Barley ..	First	2 0
8	Bhothai ..	Ramgarh ..	237	,, ..	Second	1 0
9	Siraj Uddin ..	Rajrupore ..	6	Gram ..	First	2 0
10	Mohammad Suleman	Manna Purwa	240	,, ..	Second	1 0
11	Hirwa ..	Bharawan ..	321	Arhar ..	First	2 0
12	Sukh Dev ..	Karchchana	259	,, ..	Second	1 0
13	R. D. Centre Manda Prashad ..	Sunai ..	385	Sugarcane	First	2 0
14	Sukh Dev ..	Karchchana	258	,,	Second	1 0
15	Masih ..	Gangiya ..	348	Potatoes ..	First	2 0
16	Sumeshwar ..	Kharkauni ..	77	,, ..	Second	1 0
17	Rafi Uddin ..	Mahewa ..	163	,, ..	Third	0 8
18	Shiva Prashad ..	Sultanpore ..	194	Turnip ..	First	2 0
19	Ghisai ..	Nai Basti ..	223	,,	Second	1 0
20	Boy's Home ..	..	25	Brinjal .	First	2 0
21	Sukh Dev ..	Karchchana	..	Peas ..	First	2 0
22	Bachchu Lall ..	Dandi ..	..	,, ..	Second	1 0
23	Sumeswar ..	Kharkauni ..	81	Banda ..	First	2 0
24	Nawab Hussain ..	Gangiya ..	140	,, ..	Second	1 0
25	Ghisai . ..	Nai Basti ..	221	Carrot ..	First	2 0
26	Ajudhia ..	Karkauni ..	86	,, ..	Second	1 0
27	Hasim Husain ..	Rasoolpore	195	Tomatoes	First	2 0
28	Boys' Home ..	..	64	,, ..	Second	1 0
29	Mewa Lall ..	Nihalpore ..	214	Cabbage ..	Second	1 0
30	Abdul Ghani ..	Janghirabad	291	Onions ..	First	2 0
31	Boy's Home ..	..	21	,, ..	Second	1 0
32	Sumeswar ..	Karkauni ..	73	Pumpkin	First	2 0
33	Nawab Hussain ..	Gangiya ..	139	,,	Second	1 0
34	Jamuna Prashad ..	Mahewa ..	223	Guavas ..	First	2 0
35	Hari Mallah ..	Mahewa .	239	,, ..	Second	1 0
36	Abdul Ghani ..	Janghirabad	293	Papaya ..	First	2 0
37	Sumeswar ..	Karkauni ..	72	Lauki ..	First	2 0
38	Masih ..	Gangiya ..	347	,, ..	Second	1 0

Special Prizes	Rs.	a.
Rural Development Centre Jari	2	0
Rural Development Centre Shankergarh	2	0
Farmers' Ploughing contest :—		
Bachchu Lall, Markhauni, One Plough, 1st Prize	11	0
Basantu, Gangiya, One Plough, 2nd Prize	10	0
Hanuman, Janghirabad, One Plough, 3rd Prize	5	12
Cash prizes awarded to village Handicraft	25	0
Village Gowalas Milking contest :		
Ram Dev, Dihi, 1st Prize	3	0
Ram Prashad, Dandi, 2nd Prize	2	0
Lakhan, Dandi, 3rd Prize	1	0
Village Cattle Show :—(Murrah Buffaloes).		
Rameshwar Abir of village, Dandi, 1st Prize	3	0
Ram Dass, Dandi, 2nd Prize	2	0
Murras and Deshi Buffaloes :—		
Munai, Dandi, 1st Prize	3	0
Baba Din, Nachchana, 2nd Prize	2	0
Institute Gowalas Judging contest :—		
Saha Dev, 1st Prize	2	0
Ram Kripal, 2nd Prize	1	0
Lall Jee, 2nd Prize	1	0
Two Consolation Prizes :—		
Gharan Gareriya, Dandi for best Murra Buff., in the show	2	0
Muhai, Dandi for best Heifer	1	0

Special Prizes awarded by Patrons of Farmers' Fair.

1. For the organizer (Rural Development) who supplied the most different types of work from the longest number of villages (one degchi by Jamil Uddin to R. M. Pande, Organizer, Hammanganj).

2. For the Rural Development organizer representing the next longest number of exhibits and the next largest number of villages, (one degchi presented by Dr. B. K. Mukerjee to Mr. Ram Nithor Misra, Organizer, Shukalpur).

3. To Akbar Khan from Shahjeepurva for the largest individual number of baskets, (two katoras presented by Nawab Hussain).

4. To the housewife who has opened her home for a school and is herself a part time teacher (one degchi presented by Dr. B. K. Mukerjee).

Special Prizes awarded one for Crops and Vegetables:— Mewa Lall of Nihalpore (one brass ghara presented by Sumeshwar Nath for beet.

Special Prize for Labourers' Night School:—

Munnu of Indalpore for the best student in the night school (one degchi) presented by Dildar Hussain.

Special Prize for Best Pair of Bullocks for ploughing contest :—

Razzaq of Gangiya (one brass ghara) presented by Mohammad Jan.

Sur Dev of Kharka (one brass ghara) presented by Mohammed Jan for the man coming from the greatest distance in the ploughing contest.

Students' Ploughing contest: —
Benjamin Horo, First.
W. R. Chester, Second.
T. C. Dutta, Third.
Challenge Shield won by 2nd year.

Students' Judging contest :—
Mr. A. N. Misra, Champion Cup.
Mr. N. Chatterjee, Reserve Championship Cup.

Students' Showmanship contest :—
Mr. T. V. R. Iyer, Champion Cup.
Mr. N. B. Shareef, Reserve Championship.

Students' Vegetable contest :—
Mr. S. M. Marghoob, 1st Prize.
Mr. S. R. Upadhaya, 2nd Prize.
Mr. Gendan Lal, 3rd Prize.

Athletic Championship Prizes :—

1. M. D. Suri, Athletic champion for the year 1938-39.

2. S. Chatterjee, Athletic champion for the year 1938-39.

A STUDY OF AN IDEAL VILLAGE IN THE CENTRAL PROVINCES AND BERAR

Village Itki, Taluk Daryapur, District Amraoti, (Berar)

BY

M. A. KOLKHEDE, B. Sc. (AGR.)

Research Scholar, Imperial Dairy Institute, Bangalore. *

INTRODUCTION.

Of all the problems that India presents today, there are probably none so pressing, none so urgent as the problems of rural reconstruction and rural education. Rabindranath Tagore, who is better known as a poet, philosopher, dramatist, and novelist, expresses his ideas about our villages in the following statements :—

"Villages are like women. In their keeping is the cradle of the race. They are nearer to nature than towns and are therefore in closer touch with the fountain of life. They have the atmosphere which possesses the natural power of healing. It is the function of the village, like that of women, to provide people with their elemental needs, with food and joy."

"There was a time when our villages were in intimate contact with the manifold culture of this land. Towns were administrative centres serving certain special purposes, mostly of an official and professional character, while for the complete purposes of the peoples' life, the villages were cherished and served by all the capable persons of the land with the most of their means and the best that their minds

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* We take great pleasure in printing in this issue of THE FARMER the first instalment of a series of articles on "A study of an Ideal Village". The articles are a result of a very careful study of a village by one who is competent to do so. Editor, THE FARMER.

produced. But today, for various reasons, villages are totally neglected. They are fast degenerating into serfdom, compelled to offer to the ungrateful towns cheerless and unintelligent labour for work carried on in an unheathly and impoverished environment."

Problems of Rural India:—The problem of rural reconstruction in India, is not the same as was the problem of reconstructing the devastated areas of France, and Belgium, after the Great War. Their problem was only that of reconstructing the brick walls of houses destroyed by cannon shells and bombs. The problem of the Indian village is not so much to rebuild the tumbled down houses and mud huts as it is to revive and develop the village life as a whole, in all its aspects, socially, culturally, economically and from the point view of sanitation and health.

More than three-fourths of the population of India depends for their maintenance solely upon agriculture and consequently live in villages, but unfortunately these villages, which form the real India, and the bulk of the population have been totally neglected. The problem of rural reconstruction is manifold. It is economic, social, religious, educational and of health and sanitation. In order that it may be adequately and effectively attacked, all forces are required really and truly to reconstruct the whole of the country. All the sources that modern science has to offer us will have to be utilised in this task.

Civilization in every country has been changing but it has never changed so rapidly as during the present age. Our country cannot live on its past glory. That civilization was good only so far as those days were concerned. In order to suit the conditions of modern life and the present day civilization, we cannot go back to the past and seek shelter in her glories. We have to free ourselves from the fetters of the old civilization, keeping only what is best in it and building upon it with the materials that modern science has to offer us. Many of these modern ideas have to be imported from the West, but they will have to be modified to suit our conditions.

The work of rural reconstruction, even of reconstructing the whole country, is being carried on to some extent even in some of the European countries. But probably no other country in the world presents so many problems as does India. It would not be all together fair to criticize the Government for its neglect in attacking this problem, although the Government cannot be held blameless. The village industries so necessary for the prosperity of the vast population of rural India, and which for centuries have been the mainstay of the prosperity of the country, have all been destroyed by foreign industries The agricultural industry, which is the main occupation of about 75 per cent of the population has also been allowed to decay. The Land-tenure system, the illiteracy of the pesants, the lack of irrigation, and many other causes do not permit the land to flourish. The farmers can hardly make a bare living and during years of drought they are driven to extreme poverty and starvation. Some of the important causes which have led to the extreme poverty of our farmers are given in Appendix No. 1.

The Country of Extremes:—India presents extremes probably greater than those of any other country. Geographically, it shows extremes in climate, from coldest to the hottest; from the most fertile soil to the most barren and arid tracts, from the highest rainfall to the lowest; from the most healthy spots to the worst forms of epidemic-ridden regions. Economically, there are the very rich people on the one hand, living in magnificient palaces, in ease and luxury, and the starving millions on the other, living in dirty mud houses, stricken with various kinds of diseases.

Intellectually and spiritually, there are to be found in India some of the world's famous poets, philosophers, artists, and scientists, as well as saints and seers who claimed to have realised the Divine Truth, while on the other hand we find thousands steeped in ignorance and superstition. As to physical fitness also, India can boast of some of the finest specimens of strong sturdy and healthy men and women, while at the same time showing some of the poorest specimens, of all humanity. It is with the millions of semi-starved people, sunk in poverty and despair, living in the

open country and yet in the most unsanitary conditions, and suffering from all sorts of diseases, that we are concerned here. In short the rural problems may be summarized as follows :—

Cities like Bombay and Calcutta, do not represent India. It is the Indian village which with all its worst sanitation, ignorance, distress and superstitions shows the true picture of real India. It is in the cottages of these 700,000 villages that the heart of this nation lies ; unless therefere this heart gets proper nourishment, the body *i. e* the nation cannot hope to prosper any more.

An Indian Agriculturist is the foundation on which the whole economic prosperity of India rests, and upon which the structure of its social and political future must be built. But today, he is completely sunk in the darkness of ignorance and is very much suffering from distress and poverty. He is completely in the clutches of money-lenders and does not get sufficient food, clothing and proper housing.

Solution to the Rural Problems:—

In connection with the solution of these problems, the great poet Rabindranath Tagore, advises the young generation through his famous poetry as follows:—

"Leave this chanting and singing and telling of beads! Whom dost thou worship in this lonely dark corner of a temple with doors all shut?

Open thine eyes and see that thy God is not before thee!

He is there where the tiller is tilling the hard ground, and where the path-maker is breaking stone, He is there with them in sun and in shower.

And his garment is covered with dust.

Put off thy holy mantle and even like him come down on the dusty soil!

Come out of thy meditations and leave aside thy flowers and incense!

What harm is there if thy clothes become tattered and stained?

Meet him and stand by him in toil and in sweat of thy brow."

Thus it is seen that all our activities of rural reconstruction must centre round the villager and his village. In trying to solve these problems the entire social and economic order have to be changed, and all the forces available will have to be employed. The Government has to be urged to take the matter in hand and spend more money on education, public health and agricultural improvement than it has done hitherto. In the very name of human justice, and in consideration of the worth of human life, the Government ought to come forward and contribute its share in removing the poverty of the people and freeing them from diseases.

Propaganda needs to be conducted on platforms as well as in the Press, to stimulate the people. The masses need to be made to understand India's position in comparison with that of other countries. They also have to realise their own responsibility in the performance of the great task of reconstruction. In doing this the differences between the various communities, castes, creeds and races will need to be carefully and cautiously adjusted. The people should be made to forget these differences for the sake of the common good, and to realise that anything they do to help each other will react not only to their own good but to that of their Mother-land also.

Unless the people are willing to free themselves from evil customs and superstitions, to break the bonds of caste and themselves give freedom to the millions who are called untouchables, the country connot expect to be free from the outside yoke. So, then, to attain true freedom, progress has to come from within. Many years ago Tagore expressed this, and his words stand as true today as they did then:—

"Whenever the people of one single village will have learned effectively to combine for the promotion of health, education, employment and enjoyment of life of each and all within that village, they will have lighted a torch in the

path of Swaraj for the whole of India. Thereafter it would not be difficult to light one torch from another, and so Swaraj will advance of itself, not only by the path traversed by the mechanical revolution of the 'Charkha' or such like, but along the route of multi-sided development illumined by its spirit of self-reliance."

The great poet Tagore has said in the above statement that when one village is organised, it will be easy to organize the surrounding ones. The statement is perfectly proved, as the human nature itself is like that. People are always ready to follow good things, when they actually see their benefits, *e. g.* nobody has made any great propaganda for sewing machines, still people are buying them in large numbers even in villages. This is because, they have realised its advantages. The same is the case with match-boxes, nobody has gone in villages to advertise them. Thus from several examples it is seen that villagers are ready to follow any improvement which is really useful for the betterment of their conditions.

I have therefore, described in the first part of the 'Study', the various rural reconstruction activities which are going on in a Berar village. In this village (*i. e.* Itki) three are 22 various co-operative societies which are given in Appendix No. 2. The most important of them is the 'Kisan Stiti Sudharak Sanstha, (—a society for the improvement of farmers), the 'Shikhnotejak Mandal, (—a society for the improvement of education), and the 'Village Panchayat'. All these societies are working very satisfactorily and have done much good for the villagers. Many of the officials and non-officials in the province are fully aware of the activities in the village. From time to time they have visited it and have expressed their satisfactory opinions about the different societies.

Officers of the Agricultural and Co-operative Departments found the village as an ideal one under the present circumstances that are prevailing in other villages. Therefore with the object of giving good lessons to the other villages, the Government took 119 slides of the work in this village.

Nowadays these slides are shown in various villages to show the people the path-ways to their improvement. Details of these slides are given in Appendix No. III. All this work is the outcome of the untiring efforts of 'Karmavir' Rao Bahadur U. S. Patil, and his maternal uncle—Dadasaheb Methkar. Rao Bahadur is well known to the province as 'Panchayat Expert.' Due to his expert guidance and counsel he has made his Panchayat an ideal one in the province. The key-note of the work of rural reconstruction is 'Co-operation', which will be found running through all the pages of this study.

In the second part of this study, I have given a comprehensive scheme of rural reconstruction which will raise the economic, social and educational standard of our villages.

Physical Characteristics of the Village

Situation :—The village Itki is a true representative of the Ryotwari villages in Berar. It is only 6 miles from its taluk place, Daryapur, and 35 miles from the district place, Amaroti. The nearest Railway station Leghaon (the writer's village), on the C. P. Railway line is 3 miles from the village, and is connected by an ordinary village road, which is quite good in summer and winter, but becomes dirty during the rainy-reason. A big *nalla* (a rivulet) flows by the East which supplies water to the cattle during the rainy-season.

Geological Characteristics :—The village is at an average sea level of 1100 feet Its geological formation is Deccan Trap, the disintegration of which has given raise to the deep black soil which is well known as 'Black Cotton Soil,' due to its capacity of growing the best crop of cotton. All the area is quite plain and offers good facilities for cultivation.

The soil is largely a deep black loam, which cracks into a solid mass in the beginning of the dry weather and cracks freely in all directions later. These fissures run to a depth of several feet and give the soil a reticulated appearance, hence the statement that 'Black cotton soil ploughs itself'. The soil is locally known as 'Thet or Awal Kali,' is of fine texture, very retentive of moisture, becomes sticky when wet,

cracks freely in the hot weather and is comparatively heavy to work.

It is also known as 'Chikni,' which is the heaviest of the black cotton soil. It is very fertile and is well suited for cotton, *juar* and wheat. However in years of heavy rain-fall it results in water-logging. The water bearing stratum is very deep. It varies from 40 to 60 feet. The water is saltish on account of a higher percentage of Sodium salts. When the *nalla* is in floods, in rainy-season, it deposits large quantities of silt on its banks and renders the fields most fertile. But sometimes also causes damage due to big floods. The soil is fairly rich in humus and other plant nutrients.

Climate and Rainfall:—A thermometer is kept in the school, and the daily maximum and minimum temperatures are noted every day. The maximum temperature goes to 116° F. in the month of May and the minimum goes to 56° F. in the month of December. On the whole the climate is quite congenial to the health of the villagers except in May when it is too hot. It is gratifying to note that a rain gauge has been kept here by the Society, and up-to-date records of rainfall for every day and month are maintained. The average rainfall for the last 10 years (1927-36) comes to 32·14 inches The following chart shows the rainfall of the village for the last six years :—

Months ..	..	1931	1932	1933	1934	1935	1936
January ..	..	0 23	..	..	..	0·3	0 65
February .	..	..	1·14	..	..	..	3·14
March ..		0 13	1·71	..	..	..	0·25
April ..	..	0·26	..	..	..	..	..
May ..	.	..	0·21	1 99	.	..	0·87
June ..	..	5·61	3·76	5·47	2·81	5 10	8·34
July ..		12·35	14 62	7·50	7·19	12 20	2·80
August ..	..	8·43	4·18	8·68	12·1	6·19	2·97
September..	..	5 65	4·94	19·66	4·98	10·32	4 16
October ..	..	11 74	2·77	1·27	..	0·45	
November .	..	0·77	..		2 0	..	11·70
December ..	..	0·2	..	...	..	..	
Total	..	45·14	33 33	44·57	29·08	34·26	38·88

From the above chart it is seen that the rainfall is increasing during the coming years and the cotton crop is therefore suffering from water-logging. It is not much suffering due to increase in the total rainfall, but due to heavy rains in the month of September, which cause a great damage by dropping the bolls.

Water Supply :—In this respect the village is most unfortunate. The water is very saltish and that too insufficient. This is not the only village having the saltish water but almost all the other fifty villages in that range also have the same difficulty. Still however due to ideal co-operation amongst the villagers, they never feel the deficiency of water which is felt in the other un-organised villages. Every year, the Village Panchayat tries its best to increase the supply of water by digging new wells and by repairing the old ones. At present (*i.e.* 1937) there are 4 big common wells and 52 other small wells. The big wells supply water throughout the year, but some of the small wells go dry in summer. Besides this, the water of the *nalla* helps much during the rainy season, and some months in winter. Strict care is taken by the Panchayat in adding potassium permanganate to all the small ponds in the *nalla*. Water for drinking and other domestic purposes is reserved.

Efforts for increasing the supply:—It is said that, beyond a certain depth we get ample supply of good water. In Gujrath they got sufficient water at a depth of 200 feet. Knowing this the villagers requested the Provincial Government to try this experiment in their village. For this purpose they promised to pay Rs. 10,000 towards the cost of the experiment, if it would be successful. But owing to some difference of opinion between the president of the society and the Deputy Commissioner, the experiment was started at Daryapur, which is a taluk place. During the two years (*i.e.* 1926-'28), the boring machine dug to a depth of 1373 feet. But still they could not get sufficient water. The work was therefore stopped. The Panchayat then dug two big wells, which partly solved the problem. Now they got the sanction and half the fund from the District Board to dig a big tank 300 × 300 feet. The estimated cost of

digging the tank is Rs. 5,000, of which half is to be borne by the Panchayat. When the tank is ready within a year or two, the problem of water supply will be completely solved. All this is due to their sound co-operation for better living, otherwise they also would have been in the same distress and apathy from which other villagers are very severely suffering today.

(Incomplete)

Appendix No. 1

Some of the Important Causes which have led to the Poverty of our Villagers: —

1. Complete failure of Monsoon, or deficient or excessive rainfall.

2. Insufficient means of irrigation or practically no irrigation facilities in many parts.

3. Low productive power of land, either due to the continued use of the same land for years or for want of good seed and manure.

4. Absence of the latest scientific methods in agriculture and improved implements.

5. Improper methods of selling agricultural produce and absence of good marketing facilities.

6. Excessive sub-divisions and fragmentation of holdings.

7. Spending of too much money in marraige and other ceremonies.

8. Waste of money in pilgrimage and in false charities.

9. Spending money on litigations.

10. Neglecting rotation of crops.

11. Bad methods of preserving manure.

12. Heavy burden of debt due to very high rate of interest.

13. Loss of good cattle in famines and due to various diseases.

14. Decay of cottage industries.

15. Neglected cattle and dairy industry.

16. Extravagance in drink and other intoxicants and narcotics.

17. Spending money in gambling.

18. Sudden fall in the prices of some of the money crops like cotton.

19. Ignorance about personal and social hygiene.

20. False belief in many social and religious customs.

21. Lack of education.

22. Absence of any subsidiary industry during the dry seasons.

23. Lack of commonsense and co-operation.

24. Cheating by middle-men and agents.

25. Not inclined to adopt any improvement due to old customs and superstitions.

Appendix No. 2

List of Different Societies in the Village.

No.	Name	Started in
1	Shikhnotejak Mandal (A society for the improvement of education)	1918
2	Panipaidas and Jopasana Mandal (A society for increasing the supply of water)	1920
3	Anath-Durbhikha Niwarak Sanstha (A famine relief society)	1921
4	Kisan Stiti Sudharak Sanstha (A society for the improvement of farmers)	1922
5	Kisan Mofat Wachanalaya (Free library for the farmers)	1923

APPENDIX No. 2.—(*continued*)

No.	Name	Started in
6	Hanuman Vyamshala (Physical culture union) ..	1925
7	Gram Panchayat (Village Panchayat *i. e.* a village court)	1925
8	Kisan Mofat Aushadhalaya (Free dispensary for the farmers)	1926
9	Kisan Boarding (A boarding house for farmers' sons) ..	1926
10	Khasgi Knynshala (Girls' School)	1926
11	Shikhnotejak Book-depot (An educational book-depot) ..	1926
12	Bal-vakrutwatejak Mandal (A debating society for boys).	1926
13	Surang Shai Karyalaya (A society for the manufacture of ink)	1926
14	Kalabatu Kalabhuvan (A society doing embroidery and knitting work out of silver and golden threads) ..	1928
15	Vanita Samaj (A society for women)	1928
16	Kisan Pedhi (Farmers' Bank)	1928
17	Vidharbha Gram Panchayat Sangh (a federal society of all the village Panchayats in the Province) ..	1928
18	Vidharbha Gram Panchayat Sangh Book-depot (a book-depot of the above central society)	1930
19	Gao Sabha Mandal (Villagers' general meeting) ..	1932
20	Vastu Kothe Sapadtil (A society to get the things lost by the villagers)	1932
21	Dharmala (A society which supplies water to the villagers' cattle)	1932
22	Kisan Co-operative Shop (The Farmers' Co-operative Shop)	1934

Appendix No. 3

Description of the Slides about the village

S. No. of Slide.	Particulars.	Number Required
1	How an intelligent Patel can improve the condition of his cultivators	2
2	Lehegaon Railway Station	3
3	Itki village	2
4	Map of Itki village showing Varalies, area, population, etc.	3
5	Map of Itki village showing stone boundary marks ..	5
6	Part I	2
7	Old implements in use	1
8	Herd of unselected cows and scrub bulls	1
9	Housing of bullocks	1
10	Housing of cows which are enclosed in a 'Wadga' ..	2
11	Condition of cultivators	1
12	Well-to-do cultivators engaging tutors for educating their children at houses..	1
13	Boys going to towns for secondary education.. ..	2
14	System of storing dung in open heaps	2
15	Encroachment on houses. People fighting	2
16	Encroachment of fields ; some cultivators change the situation of Varalies etc. and this leads to litigations ..	2
17	Cultivators borrowing money from Saokars at a high rate of interest and securing improved seeds, implements, etc.	1
18	Cultivators heavily indebted. Saokar files a suit and obtains decree. Taking possession of property ..	2

APPENDIX No 3.—(*continued*).

S. No of Slide.	Particulars.	Number Required.
19	Condition reduced	2
20	Part II	2
20A	Objects of the Society..	..
21	Rao Bahadur U. S. Patil	1
22	Mr. Raoji Chandrabhanji *alias* 'Mamasaheb', uncle of R. B. U. S. Patil, who has taken a very prominent part in the activities of the Society..	1
23	Village School. Rao Bahadur starts this school in 1918 after completion of his education at Amraoti ..	2
24	Agricultural Assistant demonstrating the improved plough to the village cultivators. Rao Bahadur and his maternal uncle attend this demonstration and are well impressed	1
25	Roseum seed farm of Rao Bahadur	2
26	Saoner juar seed farm of Rao Bahadur	1
26A	Ramkel seed farm of Rao Bahadur	3
27	Improved stock of Karbi	1
28	Improved stock of wheat-straw	1
29	Agricultural Assistant addressing a meeting requesting the farmers to organise a Society as per scheme of Rao Bahadur. The Society is formed	2
30	Society's shop. A large stock of implements for sale ..	1
31	Society's shop. Stock of implements, seeds, manures, etc. sales going on	2
32	Members taking loans and the Society accepting deposits..	2
33	Crop protection Society. Managing body and watchmen shown	1

APPENDIX No. 3.—(*continued*).

S. No. of Slide.	Particulars	Number Required.
33A	Progress of the Society (chart)	4
34	The stud bulls of cow and buffalo	3
35	A herd of Rao Bahadur's cows	3
36	Montgomery bull, crossing a local cow	4
37	Crosses. A herd of young stock of cows and calves with their mothers belonging to the members of the Society. Progeny of the bull	2
38	An improved cattle shed	5
39	An improved manure pit	5
40	Stones for single m rk boundary system fixed in fields with remnants of old Varalies	3
41	Disadvantages of the old Varali system	3
42	Chart showing comparison of old Varalies and stone boundary marks	2
43	Gram Panchayat Court	2
44	Upper Primary School	1
45	Girls' School	1
46	Anglo-Vernacular Middle School	1
47	Akhada	1
48	Football play	1
49	Boarding (Boys accommodated in Rao Bahadur's building)	1
50	New boarding house under construction	1
51	Library	1
52	Night class for adults	1

APPENDIX No. 3.—(*concluded*).

S. No. of Slide.	Particular.	Number Required.
53	Educational progress chart	1
54	Home industries	2
55	Chart showing mortality of the village	2
56	Hospital	1
57	Inoculations and injections	2
58	Famine relief	1
59	Itki Bazar	1
60	Members applying for the registration of the Kisan Pedhi or the Farmers' Bank	1
61	Rao Bahadur obtains prizes and medals at various agricultural shows	1
62	Officers representing various departments who, helped the society from time to time	1
63	Villagers wish that Patels like Rao Bahadur, be born in every village to effect the betterment of their cultivators	2
	Total ..	119

(*Continued from page 115.*)

is another attractive feature of this section of the fair. As field tests of the varieties of crops recommended by the provincial governments are being made every year, this year, this Department is now able to make certain definite recommendations of the crop verieties that are suitable to the area.

All these have, to our mind, a great value not only to the villagers themselves, but also to the organizers of the fair and to our agricultural students who learn the problems of the agriculturists by coming in contact with them.

CHEMICAL ADVICE *

The water should be in before
    You add the H_2 SO_4;
Or else strange things might happen you—
    You may not even leave a clue.
Don't monkey much with hydroflu—
    It is a foolish thing to do;
If common sense you can't abide,
    You might as well take cyanide.

I choke and sputter when I see
    The nasty fumes of SO_3;
But I'd go with it in the gloaming,
    Before I'd take a whiff of Bromine.
If with this life you feel you're through—
    Just drink some $HgCL_2$;
Of all sure methods, true and tried,
    There's none like Mercuric Chloride.

A chemist always is, I'm told,
    A girlish sort of man;
For if he bluffs, you will agree,
    He is a charlatan (Charlotte Anne);
While if, perchance, he has the goods,
    A type, we'll say, that's wiser,
And really does the things he says—
    He's then an analyzer (Anna Liza).

The most depraved female of all,
    Is surely Ethyl Alcohol;
Yet even worse is sister Methyl,
    For one debauch with her is lethal.
When dark despair o'erwhelms you, then
    Seek sweet relief in KCN;
It's surer far you will agree,
    Then lead, or As_2 O_3.

H. V. M.

* Borrowed from the Science Leaflet, Vol. XI, No. 8.

U. P. DEPARTMENT OF AGRICULTURE, MONTHLY AGRICULTURAL REPORT

FOR FEBRUARY, 1939

I—Season.—There was little rain in the first half of the month, but in the second fortnight it was general throughout the province and in a number of districts it was above the normal.

II—Agricultural Operations.—Crushing of sugarcane continues. Sowing of sugarcane and irrigation of rabi and zaid crops are in progress.

III.—Standing Crops and IV.—Prospects of the Harvest.—Standing crops have been damaged to some extent by recent hail-storms. Probable outturns are generally estimated to range between 60 to 90 per cent. of the normal.

V—Damage to Crops.—There were hail-storms over a large portion of the province, but no serious damage to crops has been reported except from a few places.

VI—Agricultural Stock.—The condition of Agricultural stock is generally satisfactory. Figures showing cattle mortality during the month have not yet been received from the Director of Veterinary Services, United Provinces.

VII—Pasturage and Fodder.—Fodder and water are sufficient everywhere except in the districts of Meerut, Bulandshahr and Azamgarh.

VIII—Trade and Prices.—The following figures compare the average retail prices of chief food grains in rupees per maund at the end of the month with those of the preceding month. Prices of wheat have fallen slightly while those of others continue to rise.

	End of January, 1939	End of February, 1939
Wheat	3·187	3·090
Barley	2·393	2·456
Gram	3·283	3·358
Rice	3·895	4·008
Arhar dal	5·157	5·196

IX—Health and Labour in Rural Areas.—Public health continues satisfactory; plague, cholera and smallpox exist in a few districts. Ample employment is available for the agricultural and labouring classes.

FOR MARCH, 1939

Rainfall in the first week of the month was general throughout the province except in the districts of the Jhansi Division. The second and third weeks were practically dry but for some light showers in the Meerut, Benares and Kumaun Divisions. It was again widespread in the last week in the western districts and the Kumaun Division. Taken as a whole it was below the normal in almost all the districts of the province.

II—Agricultural operations.—Crushing of sugarcane is nearing completion. Harvesting and threshing of rabi continue Sowing and irrigation of sugarcane and zaid crops are in progress

III—Standing crops and IV—Prospects of the Harvest.—The condition of the standing crops is generally satisfactory except in areas affected by drought and hail-storm. The probable outturn of mango is estimated to be from 2 to 8 annas in the rupee in the areas effected by hail-storm and from 12 to 15 annas elsewhere.

V—Damage to crops.—Standing crops have been damaged by hail- torm to some extent in many districts especially in the Rohilkhand, Benares, Lucknow and Fyzabad Divisions.

VI—Agricultural stock —The condition of agricultural stock is generally satisfactory. The following figures furnished by the Director of Veterinary Services, United Provinces, show cattle mortality during the month:

Disease	February, 1939		March, 1939	
	Seizures	Deaths	Seizures	Deaths
Rindorpest	2,525	1,133	1,861	951
Foot and mouth	5,262	16	6,618	97
Haemorrhagic septicaemia	72	70	112	87

These figures indicate an increase in foot and mouth and haemorrhagic septicaemia while rinderpest has considerably decreased.

VII—Pasturage and fodder.—Fodder and water are reported to be sufficient almost in all the districts.

VIII—Trade and prices.—The following figures compare the average retail prices of chief food grains in rupees per maund at the end of the month with those of the preceding month:

	End of February, 1939	End of March, 1939
Wheat	3·090	2·950
Barley	2·456	2·471
Gram	3·358	3·042
Rice	4·008	3·990
Arhar dal	5·196	5·351

IX—Health and labour in rural areas.—The condition of the agricultural and labouring classes is generally satisfactory. Ample employment is available.

THE IDEAL OF THE RURAL SCHOOL

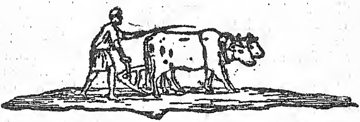
I teach !!
The earth and soil
To them that toil,
The hill and fen
To common men,
That live just here :—

The plants that grow,
The winds that blow,
The streams that run
In rain and sun,
Throughout the year :—

And then I lead
Thro' wood and mead,
Thro' mould and sod
Out unto God,
With love and cheer,
I teach !

—Quoted by L. H. BAILEY.

THE
ALLAHABAD FARMER



Vol. XIII] JULY, 1939 [No. 4.

An Editorial.

Dr. Higginbottom's furlough extended.

When Dr. Higginbottom left India about a year ago for his well-earned furlough in America, we had hoped that he would return to this country in the beginning of this academic year. News has just come from America however which informs us that he will not be returning this year as he has been appointed Moderator of the Presbyterian Church in the United States of America. This is a signal honour which has not to our knowledge been conferred on any other Missionary of the Presbyterian Church of the U. S. A. So while we very much regret his absence in this country we who are associated with him in his work in India rejoice greatly that the Presbyterian Church in the U. S. A. has conferred upon him this very great honour. We shall however look forward to his return to the Allahabad Agricultural Institute, at the end of this year, where he has served faithfully and unswervingly as its Principal for a period of over a quarter of a century.

A Digestion Experiment.

It is our very proud privilege to be given the opportunity to publish in this issue the account of a digestion experiment carried out at the Allahabad Agricultural Institute under the direction of Dr. Burch H. Schneider, the Head of the Animal Husbandry and Dairy Section of the Institute, and who is now on furlough in America. We draw the attention of our readers to the account of this experiment as we believe this is perhaps the only one of its kind that has ever been carefully carried out in this country. While such experiments are commonly carried out in the West, India has a little bit been slow in finding out the value of indigenous fodders to the cattle of this country. It would be a great thing when India will seriously take up the study of the nutritive values of other fodders in the line that is now suggested by this experiment.

* * * *

The Use of Statistical Methods in Agricultural Experiments.

We have, placed in our hands, a copy of the proceedings of the second meeting of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India. The volume was published by the Imperial Council of Agricultural Research. We have read the reports of the meeting with very great interest and would recommend its discussions and findings to all those who wish to keep themselves up-to-date with the progress of Agricultural research in this country.

We wish, however, particularly to draw the attention of all workers in the field of Agricultural science in this country to certain observations made by Professor Mahalanobis, on the place of Statistical Methods in Agriculture, in the Course of his review of the present position in this country of the use of these methods in Agricultural experiments.

"Before concluding I would like to make a few general remarks about the place of statistics in Agriculture. It is I hope sufficiently clear from the previous discussion that the first function of statistical theory is to supply an adequate technique for collecting the primary data in such a way that

valid inferences may be drawn from them. The use of the principle of randomized replication in some form or other is indispensable for this purpose. The second function is to extract the whole of the information contained in the data in the most efficient way. It has been already pointed out that the appropriate method for this purpose will depend entirely on the particular way in which the process of rando mization is introduced.

We have seen how successfully these principles have been used in the case of field trials. It is essential that the same principles should also be applied in the case of experiments of all other kinds. There is great scope for work in this direction in India. For, I am afraid, the need of statistical methods in experiments other than field trials has not yet been sufficiently recognized in this country. Much effort and time have been wasted in consequence."

* * * *

Manures and Manuring in this Country

This subject was ably reviewed by Rao Bahadur Viswanath, Director of the Imperial Agricultural Research Institute, in the second meeting of the Crops and Soils Wing of the Board of Agriculture and Animal Husbandry in India. The Rao Bahadur observed that the increases in yields due to fertiliser treatment had been distinctly greater and higher for direct manuring in the case of organic manures and better than those of artificial manures. He pointed out, however, that as a result of his study of manurial experiments in this country, that under precarious moisture conditions where rainfall was 19" and that too unevenly distributed, concentrated manures—organic and inorganic—did more harm than good. He further observed that from his review of the manurial experiments in this country he found that in general adequate supplies of organic matter in the soil facilitated the assimilation of nutrients added to the soil in the form of fertilizers.

The Rao Bahadur also pointed out that even if all the farm yard manure, which is the main source of organic manures in this country, was carefully conserved, this country would be in a position to find only about 2/5th of the normal supply required for all the cultivated soils of the country.

A DIGESTION TRIAL WITH GREEN JUAR FODDER

By Burch H. Schneider, A. P. Brooks, N. R. Joshi, I. D. Dharni and C. O. Dass.

Allahabad Agricultural Institute.

INTRODUCTION

Andropogon sorghum, commonly known as Juar (or Jowar) in India, is an important fodder for cattle at the Allahabad Agricultural Institute. Sabnis (1), in his studies in Indian forages, says that Juar occupies about ten per cent. of the total area under rainy season crops in the United Provinces. The principal Juar tracts in the United Provinces are Jhansi and Allahabad.

As there were no data in a form useable for practical feeding available for Juar grown locally, the Department of Animal Husbandry and Dairying and the Department of Chemistry conducted a trial to determine the digestibility of the common feed nutrients in this fodder.

The Juar taken for the digestion trial herein reported was sown on June 25, 1934, the day after the first shower of the monsoon rains. The fodder grew normally as the rain was evenly distributed. At the beginning of this experiment it was 104 days old. The fodder was fairly mature, but not dry. The base of the stalk was beginning to dry by the end of the experiment. The leaves were bearing a red variety of fungi, *Collelotrichum falcatum.*

PLAN OF THE EXPERIMENT

The plan of the experiment was along the same lines as that usually followed to determine digestibility of feedstuffs for cattle. The feed was selected and cut to be as uniform as possible. Each cow's ration was carefully weighed each day and a sample taken for chemical analysis. The cows had been fed nothing but the Juar fodder for a week prior

to experiment. The feces were then considered to have no undigested feed constituents other than those from this feed. For two successive weeks attendants were employed to catch the feces excreted by the cows. The feces from each cow was carefully weighed and samples taken for chemical analysis. The nutrients eaten in the feed, that is, the protein, fat and carbohydrates determined by chemical analysis of the Juar, which did not appear in the feces were considered to have been digested and absorbed from the digestive tract. Therefore, the pounds of protein (fat or carbohydrate) eaten minus that found in the feces equals the pounds digested. The pounds of protein digested divided by the pounds of this nutrient contained in the feed eaten times 100 equal the percentage of the feed protein digested, or the *digestion coefficient*.

These methods are described in detail in the report on the formulation of methods of experimentation by Forbes and Grindley (2).

Four mature dry cows from the Institute herd were used. Detailed information regarding them is shown in Table I. None of the cows was in advanced pregnancy. The trial lasted fourteen days, consisting of two periods of seven days each. The amount of fodder fed during each period was the same from day to day. This amount, which would be "cleaned up" by the cow, was arrived at from previous observations on the animals. This care was taken so that no large amounts would be refused and left over at the end of the period.

Table I.

Information regarding the cows

Name	Cow No.	Breed	Age Years	Initial weight	Final weight
Kapilla	137	Sindhi	5	616	588
nil	165	Brown Swiss-Sindhi	5	683	648
Penny	181	Brown Swiss-Sindhi	$4\frac{1}{2}$	807	798
Valencia	95	Holstein-Sindhi	6	812	836

Method of Feeding.—Enough green fodder was cut from the field each day for that day's supply. Immediately after cutting from the field it was brought to the barn and passed through a power roughage cutter. The green material was thoroughly mixed by shovelling, and individual feedings weighed out for a twenty-four hour period. A 200 gram sample was put in a tightly covered glass jar and sent to the chemistry laboratory.

Half of the feed was given the animals in the evening and the remaining half fed the following morning.

The animals were watered thrice daily, at 9·00 a.m., 2·00 p.m. and 8·00 p.m.

A weighed block of rock salt was allowed for each animal to lick twice daily for fifteen minutes each time. At the end of the trial the blocks were weighed and amounts consumed were found by difference. The amount of salt consumed was considered in computing the digestibility of the dry matter over the two weeks period. The amount of salt consumed by each animal during the trial is given below:—

Cow	Salt Consumed pounds
Kapilia 137	2·56
No. 165	2·19
Penny 181	1·57
Valencia 95	2·48

Collection of Excreta.—During the digestion trial four watchmen and one supervisor were constantly on duty. Each voiding was caught in a tray (*tassila*), immediately weighed, recorded and placed in an individual can marked with the cow's number. The cans were kept covered. Each morning at the end of the experimental day each cow's excreta was weighed and the weight checked with the sum of the individual weighings recorded as excreted. This gave a check on the weights. The entire day's excretion of feces from each animal was well mixed in a large iron pan. Then 5 per cent of the moist excreta was taken for a sample. To

this 1 per cent of 10 per cent thymol solution in chloroform (3) was added as a preservative. The samples were taken in iron trays (*tassilas*), spread out evenly and taken for drying as noted below. Two men were present at all times to check the accuracy of the work.

Exercise.—The animals were exercised twice daily. They were led for a distance of 1·6 miles each day. They were taken one at a time, attended by two men, one leading the cow and the other ready with a tray to catch any dung passed on the way.

Weighing the Animals :—The cows were weighed daily at the same time and the weights recorded in Table I give the initial and final weights. These are averages of three successive days' weighings, the average being considered the most accurate weight for the middle day.

Analysis :—The Chemistry Department of the Allahabad Agricultural Institute co-operated in carrying out all chemical analysis. The 200 gram samples of fodder taken daily were dried in an oven for about seven hours at 70° C. Then the samples appeared quite dry. The samples were stored loosely in a screen covered can open to the atmosphere to allow the feed to reach moisture equilibrium with the air. At the end of the week the total dried samples were combined, mixed, allowed to stand two days longer in the open can. The composite sample of fodder was weighed just before grinding in a small feed grinder. All determinations, including dry matter, were made on this dried sample, and the percentage of each nutrient computed on the fresh green basis. These percentages times the pounds of feed consumed gave the pounds of each nutrient ingested by each cow.

The feces samples were evenly spread in the trays and kept for sun and air drying on the flat roof of the chemistry building. A boy attendant watched them during the day to keep away birds and at night they were stored in a room. The maximum temperature recorded any day did not exceed 95° F. and the percentage humidity in the air was about seventy. When the samples appeared dry, they were weighed and finely ground in a small feed mill. Seven daily samples

of the feces from each animal were combined, thoroughly mixed and small samples taken for chemical analysis. The percentage dry matter, crude protein, fat, fiber and ash were determined. From these percentages and the pounds of feces excreted, the pounds of undigested protein, fat and carbohydrates in the fresh feces of each cow were computed.

Chemical analysis was carried out by the standard methods of the American Association of Official Agricultural Chemists. Protein was determined as crude protein, nitrogen $\times 6{\cdot}25$, nitrogen being found by the Kjeldahl method. Fat was determined by ether extraction in a Soxhlet apparatus. Crude fiber was determined by the usual method recommended by the American Association of Official Agricultural Chemists. The nitrogen-free extract was determined by the usual method recommended by the American Association of Official Agricultural Chemists. The nitrogen-free extract was determined by difference, the sum of crude fiber and nitrogen-free extract being taken as the carbohydrate content.

The Results:—Table II gives the percentage composition of the Juar fodder and the feces by weeks. Table III gives the summary of the results of the total trial period of two weeks. In order to check the accuracy of the experimental technique in one week against the other, the samples were taken and analysis carried out on a weekly basis There were no important differences between the weeks, so the extensive data on the weekly basis are not presented. The consistency of the data may be noted by comparing the digestion coefficients of each of the nutrients.

Table II

Composition of Juar fodder by weeks and of feces for each cow by weeks.

	Dry matter per cent	Crude protein per cent	Ether extract per cent	Crude fibor per cent	Nitrogen free extract per cent	Ash per cent
Juar fodder (first week) ..	28·74	1·18	0·67	10·14	14·83	1 92
Juar fodder (second week) ..	30·26	1·38	0·56	10·51	15·46	2·36
Feces:						
Cow 137:						
(first week) .	15·11	0·81	0·21	4·48	7·52	2·09
(second week) .	16·30	0·84	0·23	4·83	8 14	2·26
Cow 165:						
(first week) .	16·77	0·85	0·18	4·73	9·07	1·94
(second week) ..	16·74	0·86	0·20	4·75	8·97	1·97
Cow 181:						
(first week)	18·08	1·04	0·30	5·46	8·89	2·39
(second week) ..	18·93	0·91	0·32	5·57	9·94	2·18
Cow 95:						
(first week) .	16·42	0·83	0·30	8·30	8·30	1·95
(second week) ..	17·74	0·88	0·33	8·93	8·39	2·15

Table III

Pounds of nutrients consumed, voided and digested with coefficients of digestibility.

Cow	Dry matter	Crude protein	Ether extract	Crude fiber	Nitrogen free extract	Ash
Kapilia 137 :						
Nutrients consumed..	106·34	4·49	2·17	36·33	53·30	10·06
Loss in feces ..	53 07	2 79	0·73	15 73	26·47	7·35
Nutrients digested ..	53 27	1·70	1·44	20·60	26·83	

TABLE III—*(Continued)*.

Cow	Dry matter	Crude protein	Ether extract	Crude fiber	Nitrogen free extract	Ash
Digestion coefficient .	50·1	37·9	66 4	56·7	50·3	
Cow No. 165 :						
Nutrients consumed..	150·87	6·44	3 09	52·03	76·34	12·98
Loss in feces ..	74·22	3·78	0 83	20·98	39·25	8·68
Nutrients digested ..	76 65	2·66	2·26	31·05	37·09	
Digestion coefficient..	50·8	41·3	73·1	59 7	48·6	
Penny 181 :						
Nutrients consumed..	166·65	7·15	3·43	57·76	84·76	13·55
Loss in feces ..	81·59	4·28	1·37	24·30	41·61	10·03
Nutrients digested ..	85·06	2·87	2·06	33·46	43·15	
Digestion coefficient..	51·0	40 1	60·1	57·9	50·9	
Valencia 95 :						
Nutrients consumed..	153·91	6·55	3·16	53·00	77·76	13·44
Loss in feces ..	76·03	3·81	1·40	23·33	38·35	9·13
Nutrients digested ..	77·88	2·74	1·76	29·67	39·41	
Digestion coefficient..	50·6	41·8	56·7	56·0	50·7	
Average Digestion Co-efficient	..	40·3	63·8	57·6	50·1	
Pounds of digestible nutrients per 100 pounds of fodder (average) . ..	..	0·5	0·4	6·0	7·6	

Conclusions:—The first object of this experiment was to get definite information regarding the digestibility of Juar fodder, and express it in a form usable in the practical feeding operations at the Allahabad Agricultural Institute. It is hoped that the information may be of value to other livestock feeders. From the reported experiment we may conclude that the average digestion co-efficients of green Juar fodder are

51 for dry matter, 40 for crude protein, 64 for fat (ether extract), 58 for crude fiber and 50 for nitrogen-free extract. Somewhat higher digestibility might be expected when fed in complete rations having a greater proportion of protein.

The percentages of digestible nutrients in Juar fodder (or pounds of digestible nutrients per 100 pounds of fodder) are 14·9 of digestible dry matter, 0·5 of digestible crude protein, 0·4 of digestible fat (ether extract), 6·0 of digestible crude fiber and 7·6 of digestible nitrogen-free extract (or 13·6 of digestible carbohydrates).

The most significant data from this experiment expressed in tabular form so they may be used in computing rations by the Morrison feeding standards (4) are as follows:—

Total dry matter per cent.	Digestible protein per cent.	Total digestible nutrients per cent.	Nutritive ratio.
29·5	0·5	15·0	1: 29·0

The authors are of the opinion that these data expressed on the fresh basis giving the per cent dry matter of the green fodder are of somewhat greater value to the practical feeder of cattle than the method of presenting data on feed composition on the complete dry matter basis used by some investigators in India. Feedstuffs as fed to farm livestock always contain from 4 to 88 per cent of moisture, and the per cent dry matter determined by actual analysis is to be preferred to an "assumed" dry matter content. The results of nutrition research in India should be expressed in a form most useful to animal husbandmen.

The second object of this experiment was to find whether, with the Department of Animal Husbandry and Dairying and the Department of Chemistry co-operating, the Allahabad Agricultural Institute could undertake this type of research. The experiment herein reported was conducted during Dasera holidays with the teaching staff taking part in this experiment sacrificing their vacation. If funds are made available for teaching and research, the number of personnel could be increased; so digestion and other experiments on local feedstuffs and livestock might be undertaken.

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"The conclusion was driven in upon us that *the Indian villager is not helped unless he is helped simultaneously in every phase of his life, and in regard to every relationship he bears to others. The service must be comprehensive to get anywhere, and it must be simultaneously comprehensive. In other words, what is wanted is not reform but reconstruction, from the centre out and all round.*"—K. T. PAUL.

" The greenest grass is o'er the hill,
The cow said to herself;
The finest goods came from a mill
In China, said Miss Pelf.

It is a trait of man or beast
To think that better things
Are found with which to have a feast,
In lands of other kings.

But if we'll stop and look around,
We'll get a glad surprise
The best of things we need are found
Right here beneath our eyes."

(Quoted from "Farmers" Federation News, Asheville, N. C., U.S.A.)

MARKETING OF WHEAT IN ALLAHABAD

By S. R. Misra, B.A., Dip. Agr.

The production and disposal of crops are the two most important aspects of agriculture. While the former is conducted directly by farmers and is largely under their control, the latter which comes under marketing, is conducted and controlled by non-farmers in India Market is the connecting link between Production and Consumption. In actual practice the field of marketing is as vast as that of production. Every market, every commodity sold, has some features of its own as distinguished from others. A good grain-dealer may not be equally good as a vegetable or fruit-dealer and *vice versa*; a good dealer in Allahabad market may not be equally good in the Cawnpore market in dealing in the same commodity and *vice versa*. Marketing also requires time and accumulated experience such as production does.

While there are so many divergent things in connection with markets and marketing there are also many things in common. As such, a study of the way in which a particular commodity is sold in a particular market, cannot be without some use and applicability in regard to others. Grains coming from the south of Allahabad are sold mainly in the Gaughat and Muthiganj wholesale grain market-places or the "Naj-Mandis." After crossing the Jumna Bridge the sellers have to stop at the Gaughat Municipal octroi-barrier for payment of the octroi on the grains after which they enter the *mandi* (grain market). The charges which are attendant on the sales are as follows :—

Municipal Charge :—

1. Chungi or octroi—at 1 anna per md. of wheat.

Charges in the Mandi:—

2. Dalali—at 0-4-0 per Rs. 100, value of grain both from seller and buyer,

3 Bayayi –at 0-12-6 per Rs. 10 ', value of grain from seller only. Also sometimes one pice per sack in addition.

4 Garda-khad, at 2 *pao* (1/2 lb) or 8 *chhataks* of grain per *maund* (82 lbs) of wheat.

5. Khonchi—at one pice per sack of 2½ mds. of grain.

6. Dana – at different rates. See the notes below.

7. Kanta – at one pice per sack.

8. Lekha—at a few pice per transaction.

9. Coolie – at one pice per sack per handling.

10. Godam – at Rs. 2 per 100 sacks per month.

Chungi.—*Chungi* (octroi) is charged by the Municipality from each one whoever may bring any commodity within its limits. This is a kind of Municipal revenue. For wheat the charge is one anna per maund. This charge varies for various commodities and also may vary periodically for the same commodity. However, for the grains it has been almost stationary When a bullock cart loaded with sacks of grains is stopped at the octroi-barrier, a municipal servant approaches the cart and pierce his *parkhi*—a semi-round iron hook about 10″ to 12″ long and 1″ thick—in many or all the sacks and makes sure what grain it is, if it is one or more than one kind of grain in all the sacks. He makes the cartman take a few sacks for weighing on the "Barrier' balance. The municipal servant never fails to choose bigger sacks for weighing. Then he counts the number of sacks and makes full report to the *munshi* (a clerk). The *munshi* calculates the quantity, enters figures in his receipt-book and after payment of the required amount of octroi issues receipt to the payer. Then the grain-seller takes his grains to the *mandi*.

It is not a rare sight to see traffic stopped at the octroi-barrier for hours for octroi-receipts, especially on the days following the Allahabad feeder-market days. When this happens, there follows a rather keen competition among the seller-entrants to succeed in securing octroi-receipts without undue loss of time. In so doing the seller-entrant in the city does not mind paying a little more than the legal octroi charge in order to avoid undue waiting which involves him

in more loss. With lack of proper municipal management and efficient checks the low officials on the place find it difficult to resist such ready temptations. In spite of all this a habitual grain-dealer who buys grains from outside the municipal limits and brings them into the city *mandi* for sale pays the least beyond the fixed octroi rate because his grain-sacks are uniform in weight, the standard weight of each sack being two maunds and a half. The case with the producer-seller is different. As he himself accompanies the sale- grains he does not feel the necessity of properly weighing his grains and making the grain-sacks uniform in in weight before-hand. The result is that, as the big bags are first chosen at the octroi-barrier for weighing, he has to pay more octroi on the total quantity of his grains than what he would have had to pay, had his sacks been uniformly filled in.

Dalali and Bayayi.—After getting rid of the octroi-barrier a seller approaches the *mandi*. The first man he is sure to come in contact with in or around the *mandi* is a *baya* or a *dalal*. A *baya* does both buying and selling. A *dalal* also plays the same role but there is a difference between the two. A number of *bayas* are attached to a particular *mandi*. A *dalal* is free to move from *gaddi* * to *gaddi* and *mandi* to *mandi*, knowing the rates and needs for different kinds of grains of both the buyers and sellers. He can always be seen with an *angochha* (a piece of cloth) hanging round his shoulders with at least four or five samples of grains tied in it and a *parkhi* in his hand. Both the *dalal* and the *baya* receive their dues from the seller and the buyer, but in a different way. Suppose 'A' is a seller and 'B' is a purchaser in a particular transaction. A *dalal* will receive his *dalali* dues both from A and B at the rate of As. 4 per Rs. 100 on that transaction, which, in fact, means As. 8 per Rs. 100. A *baya's bayai* dues will be deducted from A or the seller only, by B at the rate of As. 12-6 per Rs. 100 out of which B or the buyer and the *baya* will share half and half. In

* In and outside the grain-mandis there are some big permament grain shop-keepers who are known a '*gaddiwals*' or *kothiwals* who have *pucca* buildings for storing grains for sale.

some *mandis* the buyer may keep to himself a share of As. 8 or As. 8-6 and allow the *baya* As. 4-6 or As. 4 only. It should be noted here that a buyer in the grain-*mandi* is generally a *gaddiwal* or *kothiwal* to whom a few *bayas* are attached. A *baya* settles the rate and supervises the weighing of grain-bags both in buying and selling for his *kothiwal.* When a *kothiwal* sells grains to any other buyer, the *bayai* charge is again deducted at the rate quoted above. The *bayai* charge is compulsory whereas *dalali* has to be paid only when a *dalal's* service has been made use of. Over and above the rate of As. 12-6 quoted above, a *baya* may receive a few pice per transaction or a pice per sack from a seller at his pleasure but this generally happens with inexperienced sellers.

A *dalal* has been notorious for his unscrupulousness and this word *dalal* has even been used as an abuse. A *dalal* or a *baya* plays his role of settling bargains between the seller and the buyer. So a *dalal* or a *baya* is a middleman between the seller and the buyer and one of the middlemen between the initial producer and the final consumer. Neither a seller is necessarily a producer nor is a buyer a consumer. A seller might have been a buyer and a buyer may be a seller at the next step.

Habitual sellers or dealers get the least bothered with *dalals*. A new or occasional seller get the most bothered. Everyone in the countryside knows quite well that there are *dalals* in and around the city *mandis* whose business is generally to deceive sellers, and they must be avoided. Still the *dalal* is the first man in the grain-market to get such sellers into his grip Yes or no, once the *dalal* makes his appearance to you, talks with you a little, walks with you a little speaks something somewhere in the transaction with or without your pleasure, he is sure to get his share Though the evil of *dalal* has been known even in places far from the outskirts of the market-places, and there seems to be a consensus of opinion about the necessity of his elimination, yet the *dalals* and *bayas* are the most common and somewhat important personalities about the market place. Such personalities cannot and should not be eliminated. A *dalal* or a *baya* is a business giant in his circle. In my opinion the *dalal* should be

harnessed to more useful purpose. There are both good and bad in the class of these sale-agents also, and it often pays to be under the protection or a guidance of a good *dalal* or *baya*.

Garda-Khad or Garda-Dhalta or dockage is an allowance which goes to the buyer. It is regarded to take care of the dirt, grit, weed or mixed seeds and any probable discrepancy in weighing. The rate of 2 *pao* (1 pao=8 ounces) or 8 *chhataks* per maund seems to have been established. It does not vary with, fairly clean or unclean grains. If the grains are very clean even then the reduction of this allowance is hardly possible. On the other hand if the grains are more unclean than usual this rate may not be more than 2½ *pao* per maund. This fact is partly responsible for the sellers not to strive to make their produce quite clean. However, an unclean produce sells lower in price and does not have a keen demand. A clean produce has a ready market and fetches much higher price. It always pays to have a thoroughly clean produce and it should always be striven for. The price is struck after deducting the *garda-khad* allowance from the total quantity weighed for sale.

Khonchi is a charge realised by the owner of the market-place or the *mandi*, but it is generally rented to a contractor. In such cases the contractors realise the *khonchi* and they are generally called *chowdhrys* in the grain-market. The *chowdhry* is regarded as the most respectable man in the *mandi*. He employs a recorder or a *munim* who records each transaction effected in the *mandi* in well-kept books. The *chowdhry* also serves partly as a banker both for the seller and the pruchaser; so he commands the confidence of the *mandi* public. He also acts as a judge in paltry disputes or disagreements and his word is respected.

Dana literally means grain, but in the *mandi* it means a kind of charge from the seller out of which miscellaneous payments are made. *Dana* charge builds up a sort of fund with the *chowdhry* out of which the *mandi chowkidars* (watchmen), policemen, the *mandi* sweeper, priest, water and kitchen servants, beggars, presents, special expenses on

festivals, etc. are paid. *Dana* may be taken out in the shape of grain, a double handful from each sack or as many double handfuls as the number of sacks belonging to a seller, from one sack before the sacks are weighed; or it may be a pice for each sack, as the rate of some other charges are, or it may be a few pice per transaction. So the method of charging *dana* depends on the business experience and knowledge of the seller.

Kanta means balance. This is a charge for just putting the grain-sacks on and off the balance during the course of weighing. This is also one pice per sack and goes to the male coolies who are expert at handling bags filled with grains.

Lekha is a charge for recording transactions which goes to the *chowdhry's munim*. This may be one or two pice per transaction, but its payment depends on the pleasure of the seller and can be easily refused.

Coolie.—Each time a grain sack is handled there is a coolie charge at the rate of one pice per sack. This handling of sacks may be in the form of unloading them from a cart, weighing them, putting them in the store, if not sold, bringing them back from the store, and so on. These coolies in the *mandi* earn a lot. One can employ one's own coolies but they generally prove so inefficient in comparison with the *mandi* coolies at handling bags of grain that one is compelled to employ the latter.

Godam.—There is usually no charge for storing grain bags for a few days if unsold, but if they lie there for more than a week the charge may be made at the rate of Rs. 2 per hundred bags per month. However, loss in storing is generally heavier from other sources than from the above charge. The *mandi* godown is generally of *kachcha* floor and ordinary tile roof. It is leaky, dark and damp. Bags are huddled together and, having been pierced with a *parkhi*, are all over covered with holes through which some grains drizzle out at each handling or even when piled up. Rats and weevils have a considerable share of grain. These losses in the go down count a lot.

It may be noted that the further advantage or disadvantage to the seller over and above the charges enumerated above depends on his business experience and bargaining capacity. This bargaining capacity depends also very largely on the "staying and sticking capacity" of the seller. Of course, the "sticking capacity" must not amount to *zidd*. The pulse of the market must be felt. During the course of "sticking" to one thing there may and often does come a point where not-sticking or giving a way should have been resorted to otherwise one may lose the market perhaps never to get it again for a particular transaction.

I have mentioned the term "staying capacity" in reference to new or occasional sellers, especially the producer-sellers. The simple village farmers are not at all used to city life. It is a great venture on their part if they pass from morning to evening in a city. They long to return home in the evening, even when quite late in the night. The *mandi* buyers know of this weakness of the producer-sellers and they generally take full advantage of it by delaying the sales of their produce.

Conclusion.—The different charges enumerated above may cost the seller about 4 to 6 per cent. of the value of the grain sold at a certain rate. Transportation is excluded from the above which needs a separate treatment. There are half a dozen grain *mandis* in Allahabad in which grains coming from all directions are sold. The above account is true of all the *mandis* except perhaps some slight variations in the share of *bayayi* between the *kothiwal* or *gaddiwal* and the *baya*.

It should be clear to the reader now that it is the *kothiwal* or the *gaddiwal* who gains the most in the sale-and-purchase transactions in the *mandi*, but against this we must count the probable risk that he has to encounter because of unfavourable market fluctuations. The general economic depression has not been without any effect even on these fat *mandi* people. There have been quite a few who have ceased to work as *dalals*, *bayas* and coolies, etc. They also have their wailings. The adversity of the farmer

is the adversity, directly or indirectly, to-day or to-morrow, of every one.

We have seen the relation between the *mandi* grain-dealers (the *kothiwal* or *gaddiwal*) who is really the general buyer and the outsider seller. The relation between the same grain-dealer who is also the general seller and an outsider buyer may also be noted. Such an outsider buyer if he purchases any grain gets two *pao* of *garda* and *dhalta* per maund and has to pay *bayayi* at the rate of half pice per rupee or 12 as 6 p. per Rs 100/ of the value of grain after the allowance for *garda-dhalta*.

The system of markets and marketing which has obtained so far in our country does not deserve to be broken up. It has not been all bad. Of course, it does need to be simplified, improved, and re-organised. All legislation will not bring the required improvement in the dealings between two classes of people where one class is good in business and has control of it, while the other class knows very little about business and has almost no control over it. If one class is brought down, the other has also to rise upwards so that both classes can meet somewhere in the middle. In present-day farming a good agriculturist in order to be able to get the full value of what he may produce must be a good business-man too.

NEW STAFF

The Allahabad Agricultural Institute has been strengthened this year by the addition of several new members of the staff, namely Messrs. J. C. Gideon and S. R. Roy in the Chemistry Department, Mr. A. D. Rathore in the Animal Husbandry and Dairy Department, Mr. S. Thoomickian in the Engineering Department, Mr. K. K. Misra in the Agronomy Department, and Mr. T. A. Koshy in the Biology Department. We also look forward to the addition of a missionary from America in the Engineering Department, and an early return of Mr. and Mrs. Hatch to this country.

THE PRINCIPLES OF MAKING JAM

By A. D. Chand, M. A., B. Sc. (Ag.), F. R. H. S.

India has been preparing and using fruit jams from time immemorial. Many homes, even tod›y, make fruit following the same old crude method and using the same few recipes which have been handed down from generation to generation. No definite research has been launched upon and no fresh advancement has been made in improving and evolving new scientific methods or in developing new acceptable recipes. Most of the fruits grown in the plains and hills of India, at their peak time, are cheap and can be used for making jams at a very low cost and the import of jam from other countries can be decreased considerably. Jams are being manufactured in a number of hill stations on a small scale, where suitable fruits are grown. Unfortunately, little attention is paid to quality and cleanliness with the result that the reputation enjoyed by Indian products is very discouraging. Manufacturers are eagerly looking forward for guidance.

In order to acquire a basic knowledge of manufacturing jams it is altogether necessary to establish the definition of jam and to understand the guiding principles of making it.

Definition:—Cruess defines jam as follows:—"Jam is prepared by boiling the whole fruit pulp with sugar (sucrose) to a moderately thick consistency without retaining the shape of the fruit." Cruess' assertion that jam is more or less a homogenous mixture of fruit cooked in sugar may be carefully noted. T. N. Morris defines jam in the following words: "A jam as understood by the manufacturers, is a preparation of whole fruit boiled with sugar and having a consistency firm enough to meet the demand of confectioners and to withstand the accidents of transport without altering its position in the container or having its surface broken. In other words, jam consists of fruit tissues embedded in a reasonable firm pectin—sugar acid gel." The two authors differ greatly in their views. Where Cruess pays little

attention to gel, Morris lays more emphasis on it. Many other American authors hold almost the same view as Cruess. In practice however, we find certain fruits resulting into a homogenous jam without retaining wholly or partially the shape of the fruit. At the same time there are other fruits which afford excellent texture only if the fruits retain their shape wholly or partially and are embedded or uniformly distributed in a thick jelly-like liquid In the market we find jams of both the types. A more logical definition therefore, which would endorse the views held by both the authors may be as follows:—"A jam is the preparation of whole fruit pulp cooked in sugar either to a gel or a thick consistency, retaining or without retaining the shape of the fruit and it may contain skin and seeds."

A good jam may or may not have a jelly-like consistency and the fruits may or may not have lost its original shape, is rich bright in colour and has the characteristic flavour of the fruits from which it is prepared. From the commercial point of view jam must be firm enough to withstand rough handling during transportation, because syrupy jam is likely to leak from the glass jar containers during shipment.

The main underlying principles of jam making are more or less the same as described in detail in an earlier article on jelly making. Only a few outstanding rules will be mentioned in this chapter.

Fruits suitable for jam making—Ordinarily jams are made from almost all berries and the larger fruits which possess distinct flavour. In practice all sorts of fruits can be used for making jam and even those fruits which have no characteristic flavour of their own provided the flavour is blended by mixing other fruits or fruit juice. Jams are also made from some vegetables or the mixture of fruits and vegetables.

The fruits rich in acid and pectin make excellent jams, but the use of fruits rich in pectin or the introduction of commercial pectin has led to various abuses, because jams made from such pectinous juices tend to give jelly-like consistency, thereby making it possible to reduce the quantity of

fruit in jams without having the jams too thin or syrupy. This also renders easy the artificial manufacture of coloured jams, which are much below the standard and yet an ordinary observer cannot differentiate this from the standard jam, because such low grade jams compare favourably in appearance with standard jams. There is, however, this obvious reason that such useless jams compete seriously in the open market with standard jams thus lowering the general standard.

Standardization.—In Western countries, in order to avoid cheating, certain standards are fixed by legislation for first and second grade jams. In England all the jams are supposed to contain at least 68·5 per cent of the total soluble solids as shown, when cold, by the refractometer. The standards are also fixed for first and second class jams on the basis of the quantity of fruit or fruits used in making a certain amount of finished product. According to Morris the two grades are labeled: "Full Fruit Standard" and "Lower Fruit Standard."

There is a great variation, from the most useless to high grade products in the Indian market and unfortunately consumers want the products at the lowest possible price, paying little attention to the quality. These two things put together sink the standard of products to the bottom. It is, therefore, highly desirable that the fruit products be standardized by legislation to establish a reasonable standard in India as in other countries.

The Minimum Fruit content of Full-Fruit Standard using single fruit.

	Fruit Content per cent.		Fruit Content per cent.
Strawberries	42	Victoria Plum	40
Raspberries	38	Green and golden plum	35
Blackberries	38	Red Plum	40
Red Currant	35	Damson	38
Black Currant	30	Apricot	40
Green Gooseberries	35	Logan berries	38
Red "	40	Cherries	45
Greengage	40	Peach	40
		Rhubarb	45

Standardization of Mixed Fruit—For commercial purposes it is best to use a single fruit, but it is also a common practice to mix two or more fruits in order to blend the flavours. The best basis for blending are those fruits which have a characteristic strong flavour and acidity, though expensive fruits are most commonly blended with cheap fruits or vegetables. In India, there is a rotten practice of mixing fruits and giving the name of a fruit on the label which is not present in the jam at all. Therefore mixing of fruits on a commercial basis should be required by legislation to be indicated on the label with their respective proportion.

For standardization of mixed jams Morris states the following minimum percentage of fruit content, and the figures in brackets denote the respective proportion of each fruit required to be present in the jam.

Fruit content for first quality of mixed jam

Fruits.	Fruit per cent content.
Strawberries and gooseberries ..	40 (20×20)
Gooseberries and strawberries ..	40 (30×10)
Raspberries and gooseberries ..	40 (20×20)
Gooseberries and Raspberries ..	40 (30×10)
Raspberries and Currant ..	40 (20×20)
Plum and Apple	40 (20×20)
Apple and Plum	40 (30×10)
Blackberries and Apple	40 (20×20)
Apple and Blackberries	40 (30×10)

According to Morris the minimum fruit content of a second grade should be 20 per cent. If jams contain 20 per cent. fruit it is obvious that they are prepared by the addition of either pectinous juice or commercial pectin which should appear on the labels.

Combination of Fruits—Numerous combinations of various kinds may be practised according to the market demand. Pineapples, Strawberries, Apples, Blueberries and Capeberries are by far the best basis for blending because

of their pronounced flavour and acidity. Some of the best combinations are :

Blueberries and apple	Raspberries and cherries
Blueberries and crabapple	Raspberries and currant
Blueberries and gooseberries	Raspberries and rhubarb
Gooseberries and cherries	Jujube and gooseberries
Gooseberries and bananas	Guava and papaya
Gooseberries and papaya	Damson and plum
Pineapple and peaches	Pineapple and apple
Pineapple and strawberries	Pineapple and tomatoes
Apple and grapes	Apple and peach
Apple and pear	Apple and quince
	Apple and plum

DEFECTS IN JAMS, THEIR CAUSES AND REMEDIES.

Dull & Cloudy Jams.—The dull appearance of the jam may be due to the following reasons:

(*a*) Use of unripe fruits.

(*b*) Careless sorting and lack of washing the fruits.

(*c*) Prolonged boiling destroys certain colours such as red into yellow.

(*d*) Boiling in kettles of undesirable metal.

(*e*) Lack of skimming at the required stage

Tough or leathery Jams.—Tough jam results when sugar is added to the fruits, specially firm fruits, before they are boiled for some time. In order to avoid leathery texture, the berries should be crushed, brought to boil before adding sugar and the firm, hard fruit should be boiled in a small quantity of water for some time and then the calculated sugar should be added little by little to raise the concentration slowly.

Crystal formation in Jam—Crystals are formed in the jams if the fruit stock lacks adequate percentage of acid and pectin. The fruits should be boiled to liberate acid and pectin from the cells before adding sugar. Large proportion of sugar also results in crystalizations, therefore the amount

of sugar should be in proportion to the acid, pectin and water content of the fruit.

Dark Jams.—Dark jams may be due to burning, overcooking or exposure to intense light. The burning of jams should be avoided by crushing and constant stirring and the jam should be put away in boxes and in a cool room. Slow boiling also results into somewhat darker coloured jam.

Sticky Jams.—Large proportion of sugar in fruits low in acid and pectin results into sticky jams. Overcooked jams invariably become sticky.

Syrup Jam.—Syrupy jams are due to undercooking or using less amount of fruit.

Uneven textured Jam.—If the jams are filled in jars while hot, the fruits float on the surface leaving a clear liquid at the bottom. The jams should be filled in jars after cooking to a certain degree.

The cause of spoilage and the preventive measures are the same as described for jelly in a previous article.

Mr. and Mrs. Azariah.—Mr. Azariah who had been teaching in the Allahabad Agricultural Institute for the last two years is now making preparations to go to America for advanced training in Agriculture. Mrs. Azariah is, we understand, also to go with him. We wish them *bon voyage,* and a joyous return to their native land after their sojourn in America for a couple of years.

"It can easily be seen that the only training that is going to work effectively for the uplift of this class of people is that which trains them for life. That means training the whole man to live a higher life and not simply to earn a better living."

G. B. OGDEN.

A STUDY OF AN IDEAL VILLAGE IN THE CENTRAL PROVINCES AND BERAR

By

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(*Continued from the last issue.*)

CHAPTER II

LAND AND COMMON CROPS IN THE VILLAGE

System of land-tenure :—The law which defines the present system of land-tenure and assessment is embodied in the C.P. and Berar Land Revenue Code. It is a full occupancy tenure and is heritable and transferable property, allows the occupant to hold the land in perpetuity, and to cultivate it himself or to lease it to others for cultivation, subject to the payment of land-revenue. The land-revenue is a tax which has some of the characteristics of rent, and varies from field to field according to the fertility of the soil and other natural advantages. This type of tenure is known as 'ryotwari' in which each landholder holds his land direct from Government, and the whole land-revenue goes direct through the village officers (*i.e.* the patel and the patwari) to a representative of the Government.

Land Revenue :—The total cultivated area in the village is 2265 acres, and the land revenue is Rs. 5,049-8-0. Along with this the cultivators also have to pay for education and *kotwals*, which comes to Rs. 1,039-3-0. Therefore the land revenue and the taxes per acre come to Rs. 2-3-9 and Re. 0-7-4 respectively. So the cultivators have to pay Rs. 2-11-1 per acre to the Government.

Total area of the village for the year 1936-37 was 2344·3 acres, the details of which are given below :—

Serial No.	Heads	Area (in acres)
1	Cultivated area	2265·33
2	Under *Nalla* (Channels)	9·0
3	Fallow	4-11
4	Common grazing	29-28
5	Under boundaries	26-7
6	Under roads	9-4
	Total ..	2344-3

Sub-division and Fragmentation of Holdings:—The holdings are not much sub-divided and fragmented as is the case in other parts of the province. The condition of holdings in the year under study (*i.e.* 1937) was as follows: There are 120 survey numbers, out of which No. 3 and No. 96 are non-cultivable, having an area of 2-20 and 24-7 acres respectively. Out of these 120 survey numbers, 64 are compact and 56 have been sub-divided into 166 fields. Thus the total number of fields is 230. These 230 fields are possessed by 130 farmers Thus the average area per field and per farmer comes to 10·19 and 16·86 acres respectively.

Economic Holding:—An economic holding which will give a profitable employment to the capital and labour of the farmer, and maintain his family at an average standard of living, will be 30 acres. As there are no irrigation facilities in the village, intensive cultivation is impossible The farmer has to depend upon only one crop in a year. Therefore to maintain his family at a reasonable standard of living, his holding cannot be economic, when it is less than 30 acres. Although the holdings are not as uneconomic as the holdings in other parts of the province, still they are not as satis-

factory as they should be. The distribution is seen from the following table :—

Area	No.	Percentage
Holdings below 1 acre	1	00·72
Holdings between 1—5 acres	43	30·94
Holdings between 5—20 acres	67	48·20
Holdings between 20—40 acres	17	12·23
Holdings between 40—100 acres	8	5·75
Holdings between 100—200 acres	2	1·44
Holdings above 200 acres	1	0·72
Total ..	139	100·00

On critical examination of the holdings, I found that they are not as uneconomic as they look, because the holdings which are below 20 acres are taken on lease from a man who holds a larger area. They can be easily increased and made economic by taking a bigger area which can be easily managed by the capital and labour of the farmar.

Common crops of the village :—The most common and important crops taken are: cotton, *juar* and wheat. Wheat is generally sown only by cultivators having more than 30 acres of land, because the sowing operation of wheat requires much labour which a small cultivator cannot afford to spend.

Another reason is that, the small cultivators do not require wheat for their consumption except on some festivals ; they require only *Juar*. The following table shows the area under each crops for the year 1936-37 :—

Crops	Area (in acres)
Juar	612—14
Bajri	2—20
Wheat	340—9

Crops	Area (in acres)
Bhadali	0—4
Tur	90—22
Mung	14—34
Barbati	3—2
Math	2—6
Gram	87—9
Lakh	32—28
Peas	3—33
Masur	0—30
Chillies	2—37
Coriander	0—32
Brinjals	0—10
Bhendi	1—7
Kakadi	0—36
Til (Rabi)	10—33
Til (Kharif)	7—16
Castor	0—3
Groundnut..	0—3
Linseed	1—28
Kardi	0—3
Mustard	0—9
Cotton (long stapled Verum 434)	155—16
Cotton (Roseum)	887—11
Ambadi	6—21
Tobacco	0—7
Total ..	2265—33

Improved Agriculture:—The cultivators of the village are very intelligent, and adopt any improvement in the art of farming. On an average, it has been found that they always get better out-turn from crops than the cultivators of the surrounding villages. This can be very well judged from the following table, which shows a comparison between out-turn figures of this village and of Lehgaon—a village only three miles away.

Comparison of out-turns per acre :—

Crop.	Itki (in lbs.)	Lehgaon (in lbs.)
Cotton	375	230
Juar	620	450
Wheat	540	470
Tur	600	480
Gram	500	480

This higher out-turn which the cultivators get is due to the following reasons :—

1. Improved seed,
2. Better cultivation,
3. Economic use of manure,
4. Proper rotation.

Cattle :—The cattle of this village are better than the cattle of the surrounding villages, owing to the proper feeding and care. The breeding is controlled by castrating all the male calves below one year. Only recognised bulls are allowed in the village Through various demonstrations and magic-lantern lectures, the villagers have realised the value of their cattle and take every precaution to maintain them in a good condition. Due to this proper management and care, epidemics seldom come. But if at all they come, due to infection from the cattle of the surrounding villages, strict control masures are taken to cure them. The following list shows the number of total live-stock in the village in the year 1937 :—

Name.	No. of animals.
Bulls	1
Bullocks	197
Cows	72
Buffaloes (below one year) ..	11

Name			No. of animals
Buffaloes (1-3 years)	..	..	12
Buffaloes (adults)	..	..	50
Sheep and goats	..	..	90
Male calves (below one year)		..	27
Male calves (1-3 years)	..	..	27
Female calves (below one year)		..	27
Female calves (1-3 years)		..	19
Buffalo bulls ..	..	..	1
Buffalo bulls (below one year)		...	8
Buffalo bulls (1-3 years)	..	..	1
Horses ..	..	..	12
	Total	..	515

Implements :—Improved implements, specially good ploughs are quite essential for successful farming. It, therefore, would not be any exaggeration, if we say that 'A plough is the basis of a country's prosperity'. To supply this need of implements, the society has opened an Implement Depot which sells almost all the improved implements at a rate at which they are sold in the factory itself. The society also gives some implements on hire to small farmers who cannot afford to purchase them. The following is the list of implements in the village in the year 1937 :—

Name				No.
Country ploughs	..	..	..	2
Iron ploughs of the owners	..	..	..	21
Iron ploughs of the society	..	..	..	33
Bullock-carts ..	..	..	..	31
Bakhars (cultivators)	...	..	..	79
Davaras (interculture implements)		..	..	163
Dundias („ „)		..	...	159
Tiffans (Rabi sowing implements)		...	..	11

It is seen from the above list that, the number of ploughs is quite sufficient to plough all the land before the month of April. Because in summer the land becomes very hard and unnecessarily requires double labour. Moreover it is not necessary to plough the cotton land every year; ploughing once, in three years is sufficient. But unfortunately this is not the case in the surrounding villages where the number of ploughs is very small. On an average there are only four to five ploughs in a village, and that too are possessed by the farmers with bigger holdings. There are also no facilities to hire, when there is a will to do so. This is all due to the unorganised condition of the villagers.

"Poems are made by fools like me,
But only God can make a tree."

JOYCE KILMOR.

No nation has ever achieved permanent greatness unless this greatness was based on the well-being of the great farmer class, the men who live on the soil; for it is upon their welfare, material and moral, that the welfare of the rest of the nation ultimately rests.

THEODORE ROOSEVELT.

It will not be doubted that with reference either to individual or national welfare agriculture is of primary importance.

GEORGE WASHINGTON.

I would that the rural youth of today could see agriculture as the greatest preserver of culture, and the earth as the mother of mankind.

OLIVER EDWIN BAKER.

"Upon the valley's lap, the dewy morning throws
A thousand pearly drops to wake a single rose.
Thus often in the course of life's few fleeting years
A single pleasure costs the soul a thousand years."

(Agricultural Missions Foundation)

U. P. DEPARTMENT OF AGRICULTURE, MONTHLY AGRICULTURAL REPORT.

For The Month Of April, 1939.

I - Season—With the exception of some light showers in the first and second weeks, the month of April, 1939, was practically rainless. The total rainfall was below normal in almost all districts.

II—Agricultural Operations—Agricultural operations are generally up-to-date. Harvesting of *rabi* crops being nearly over, threshing is in full swing. Irrigation of sugarcane and extra crops is in progress.

III—Standing crops and IV—Prospect of the harvest—the condition of the standing crops is satisfactory and prospects are favourable. A statement showing the estimated outturn of *rabi* crops is appended.

V—Damage to crops—There is nothing to report under this head.

VI—Agricultural stock—The condition of Agricultural stock is generally satisfactory. The following figures furnished by the Director of Veterinary Services, United Provinces, show cattle mortality during the month.

Disease	March, 1939		April, 1939	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	1,861	951	3,412	1,904
Foot-and-mouth	6,618	97	8,795	71
Haemorrhagic septicaemia . ..	112	87	81	38

The figures indicate an increase in rinderpest and foot-and-mouth disease while haemorrhagic septicaemia has decreased.

VII—Pasturage and fodder—Fodder and water are reported to be sufficient everywhere.

VIII—Trade and prices—The following figures compare the average retail prices of the chief food grains in rupees per maund at the end of the month with those of the preceding month.

	End of March, 1939	End of April, 1939
Wheat	2·950	2·964
Barley	2·471	2·335
Gram	3·042	2·790
Rice	3·990	4·076
Arhar dal	5·351	4·769

IX—Health and labour in rural areas—Ample employment is available for the agricultural and labouring classes.

FOR THE MONTH OF MAY, 1939

I—Season—With the exception of a few light showers in the third week, the month of May, 1939, was practically rainless. The total rainfall was below the normal in all districts.

II—Agricultural operations—Agricultural operations are generally up-to-date. Irrigation of sugarcane and extra crops and preparation of land for *kharif* crops are in progress.

III—Standing crops and IV—Prospects of the harvest—The condition of standing crops is satisfactory and the prospects are favourable.

V—Damage to crops—There is nothing to report under this head.

VI—Condition of agricultural stock—The condition of agricultural stock is reported to be on the whole satisfactory.

The following figures furnished by the Director of Veterinary Services, United Provinces, show cattle mortality during the month:

Disease	April, 1939		May, 1939	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	3,412	1,904	6,220	3,399
Foot-and mouth	8,795	71	6,730	60
Haemorrhagic septicaemia	81	38	99	73

The figures indicate an increase in rinderpest and haemorrhagic septicaemia while foot-and-mouth disease has decreased.

VII—Pasteurage and fodder—Fodder and water are reported to be sufficient everywhere.

VIII—Trade and prices—The following figures compare the average retail prices of the chief food grains in rupees per maund at the end of the month with those of the preceding month:

	End of April, 1939	End of May, 1939
Wheat	2·964	2·990
Barley	2·335	2·366
Gram	2·790	3·102
Rice	4·076	4·215
Arhar dal	4·769	4·868

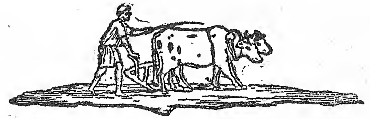
IX—Health and labour in rural areas—The condition of the labouring and agricultural classes is reported to be satisfactory. Cholera is reported from Kheri district only.

ANNOUNCEMENT

Charles Verghese, now an old boy of the Allahabad Agricultural Institute, was married on the 29th June to Miss Mariamma Mathai. He is now making plans to go to America for further study. We wish the happy couple long life and prosperity.

THE

ALLAHABAD FARMER



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An Editorial.

LL. D. for Dr. Sam Higginbottom

Those of us who are associated with Dr. Higginbottom in his great adventure for advancing the cause of Agricultural Education and of Agriculture in general in this country, are extremely proud of the very great distinction bestowed upon him by the Western Reserve University of Cleveland, Ohio (U.S.A.) when they conferred upon him the degree of Doctor of Laws.

Professor Finley M. K. Foster, in presenting Dr. Higginbottom to the President of the University said :—

"I have the honor to present to you Sam Higginbottom, President of Allahabad Christian College. Mr. Higginbottom received his preparatory school education at Mount Hermon School, Northfield, Massachusetts, and his collegiate education at Amherst College and Princeton University, where he earned the degree of Bachelor of Arts. After a period of missionary work in India he returned to the United States for further study and earned the degrees of Bachelor of Science at Ohio State University and Master of Arts at Princeton University. In more recent years he has been honored by Princeton University with the degree of Doctor of Philanthropy and by Amherst College with the

degree of Master of Science. Three times he has been decorated by the British and Indian Governments; the Kaisar-i-Hind Gold Medal (first class); the King George Silver Jubilee Medal; and the Coronation Medal of George VI. Last month, when he was elected Moderator of the General Assembly of the Presbyterian Church in the United States, he received the highest honor possible from the Church which he has served so long and so faithfully.

Because Mr. Higginbottom has consecrated himself to the service of his fellow-men particularly through education, it is fitting that Western Reserve University honor his achievements. Working in one of the most densely populated areas of the earth, he has applied scientific methods of agriculture for increased production of food and for better living conditions. Instead of preaching a social panacea based on theory, he has devoted his life to the examplification of practical Christianity with stress upon the ancient and humble virtues of unremitting labor and intelligent thrift. Because of his high ideals, his courage in the face of obstacles of which we in a more favored land have little knowledge, and his untiring devotion to and intelligent solution of the problems of his task, he has received the approbation of all men of good will. Truly it can be said of him both literally and figuratively that having put his hand to the plow he has never looked back.

I present Sam Higginbottom to you on recommendation of the University Faculty for the honorary degree of Doctor of Laws."

We have no doubt at all but that Dr. Higginbottom very richly deserves this great honour, and we are more especially gratified that this has come so soon after he has been elected Moderator of the General Assembly of the Presbyterian Church in the United States, the highest honour possible from that Church body to which he belongs.

We and all our friends in India offer him our very hearty congratulations, and hope that he will be spared long to serve India and the cause which he believes to be his Master's.

Dr. Ethel Cody Higginbottom

We take great pleasure in announcing through the pages of this magazine the great news which came to us recently that the degree of Doctor of Humane Letters has been conferred upon Mrs. Higginbottom, wife of Dr. Sam Higginbottom, the Principal of the Allahabad Agricultural Institute, by the Western College of Women of Cleveland, Ohio, (U.S.A.). We rejoice greatly that her efforts for improving the lot of the poor and the depressed of this country have not been overlooked, and that her writings for the advancement of the cause which she believes in have attracted the attention of the litterati of that great country, the United States of America.

THE ROLL-LESS CHURN: A NEW DESIGN

BY

JAMES N. WARNER, M. SC.,

Professor of Dairying, Allahabad Agricultural Institute.

A new design of butter churn has recently been developed. The "Roll-Less", or as it is sometimes called "No-Roll" churn, seems to be a type of churn in which a better quality of butter can be manufactured. It has already received very wide acceptance in the commercial creameries of the United States and may, in a few years, replace the combined churn and worker unit or the standard roll churn. The standard roll churn, because of its advantages over the separate churn and worker unit, was adopted in the butter factories of America many years ago, although the latter has continued in somewhat extensive use in European countries.

Regarding the new design C. H. Parsons of Swift and Company, Chicago, Illinois (1), says: "There are two types of roll-less churns. One, the all metal churn, and the other, the wooden barrel type of standard design in which the roller is removed, and in the barrel of this churn is installed a series of baffle boards and shelves. In the all metal churn there are no baffle boards but, instead a certain design of rib formation is cast into the churn. The metal used in the construction of this churn is a special aluminum alloy, highly porous, to prevent the butter from sticking to it during the working process."

As you are aware, no doubt, the earliest churns were simply containers in which the cream or milk was placed and well agitated until the fat collected in a form which we have come to know as butter. Such a churn is widely used in India today. An ordinary earthen-ware container in which the cream or milk is placed, usually allowed to coagulate, and then agitated by means of a crossed stick that is inserted

into the container and rotated first one way and then another by means of a rope, is a type of churn we may see in any village. Perhaps the earliest type was an animal skin churn. The cream, or more probably the milk, was placed in these skins which were then suspended from a tree limb and swung back and forth until churning occurred. We see this type of container used commonly for watering city streets here in India. Even today we have churns made on that principle which are called swing churns. They are, however, not used very widely.

The fact that the separate churn and worker unit gave way to the combined unit several years ago in the larger industrial creameries of the world suggests disadvantages in its use over the more modern unit. The principal one of these disadvantages is in the yeast and mold content of the finished product, it being more difficult to satisfactorily clean the separate working unit than it is the combined unit Such a separate worker remains exposed at all times to the air. All of the dust and contamination which the air contains, therefore, may settle on it. It is difficult, for this reason, to properly clean this worker, despite every precaution being taken in the procedure. If live steam under pressure is available it might be more effectively sterilized before use by subjecting it to a thorough steaming. Intermittent or repeated steaming would be better. This would reduce the yeast and mold content of the butter.

In the case of the combined churn and worker unit, and also the separate churn and the separate worker so far as the process can be applied, the method of proper cleaning is somewhat as follows (2):.

Immediately after use the churn is filled to about one-third its capacity with pure water at about 120 to 140 degrees F. The churn is then rotated for several minutes and drained. This is followed with a hot water rinse, containing an ample quantity of a good washing powder, at a temperature of at least 200°F. The washing powder should not be a strong alkali because of its effect on the wood. A good carbonate powder is preferable. The churn is rotated at

churning speed for about 15—20 minutes and drained. It is then turned so that the doors are on the top side and allowed to air out a while. It is again drained and turned so that the doors are about two-thirds the way to the top. They are covered with a fine mesh screen or muslin and the churn is finally allowed to cool and drain through the open buttermilk gate.

It is almost impossible to subject the separate worker unit to such a process as you can readily see. It stands for reason, therefore, that since this procedure has been found to be most satisfactory in reducing the yeast and mold content of butter and since the separate worker cannot be thus treated, the finished butter in the case of the separate churn and worker unit will be of a lower quality. This is particularly true after the butter has been stored for a while during which time the yeasts and molds may grow. The bacterial content of butter made in the two types of churns is very much the same.

Defects that are evident in moldy butter are familiar to most of us. They are colour and flavour defects. We have molds which will grow quite well and produce black, blue, or white areas on the butter. Yeasts may give us white, black or red discolouration. Mold also gives us a distinct flavour which in butter is certainly not desirable. We do not like mold flavour in our fruits or other foods, except perhaps some varieties of cheese, such as the Roquefort and Camembert cheese. Consequently we wish to reduce the yeast and mold content of the butter and thereby improve its keeping quality and flavour. If we do not do this the butter cannot be sold at the price it might otherwise demand

In the combined churn and worker unit there is particularly one point where large numbers of yeast, molds and bacteria can enter into butter. In order that the rollers may be operated a shaft must pass through the end of the churn to each roller in order to transfer power to them for their operation. Each end of the roller must be very firmly fixed into the churn by means of a metal shaft, either by passing it through the churn as suggested above or by fixing it by means of a bearing within the end of the churn. This particular

point is very difficult to pack satisfactorily to prevent the cream, from getting into it, as well as to prevent the lubricant, which must be supplied to such a union, from getting into the cream. No packing or packing nut has been developed as yet which entirely prevents cream from getting into such a joint and/or permits proper cleaning and sterilization It stands for reason, therefore, and we must recognize it, that we do get large numbers of yeasts, molds and bacteria from these boxings. They are a great source of contamination of the butter.

There are advantages, however, of the combined churn and worker unit which are important. The body and texture of your finished butter is usually somewhat better than butter made with the other type of churn also, the composition is more uniform. The advantages, therefore, are such that the defect mentioned in detail above is overshadowed. If such a churn, however, could be developed in which this particular point of contamination of the butter was eliminated, it would be a great improvement. Efforts have, therefore, been made towards this end.

This brought up the question as to the extent to which the rollers might be removed from the combined unit and the butter be properly worked without them by perhaps altering the design of the tables or shelves inside the barrels of the churn. This was studied experimentally. The result was that there were three or four different types of tables constructed in churns and an attempt was made to determine which was the most satisfactory.

In the standard combined churn and worker unit, in addition to the rollers which may vary in number from 1 to 4, there are practically always two tables or shelves which are fixed into the sides of the churn, parallel to the axis of rotation of the churn. These serve two purposes :

(1) To help and carry the cream from the bottom of the churn to the top as the churn rotates and then drop the cream back to the bottom to effect agitation.

(2) To guide the butter into the rollers at the time of working.

Such churns usually have two speeds, churning speed and working speed. In the roll-less churn the shelves have been constructed as suggested in different ways, either parallel to the axis of rotation of the churn or more or less diagonal to that axis. The latter not only helps to carry the cream from the bottom to the top of the churn as the old type of shelf does, but also tends to shift that cream either from one end of the churn to the other, from the centre to the end and back to the centre or from the end to the centre and back towards the end as the churn rotates. This motion is dependent upon the construction of the shelves. The possibility of such different motions during rotation being used for the working of butter was considered. Little advantage of one type of shelf over another has been found in this respect. All, however, have proven to be quite satisfactory for working butter. These different shelf designs are used in designing the interior of the roll-less or no-roll churn.

There are at present about 350 (3) of the roll-less or no-roll churns in commercial use in the United States, and very favourable reports are coming from nearly all users. Some of the advantages of these newer type churns, according to Mr. W. R. McEwen, Advertising Manager of the Cherry-Burrell Corporation, Chicago, Illinois, (3) are:

1. "The cream is churned as much as six or seven minutes quicker in the roll-less churn, indicating greater agitation which may be taken advantage of by a slightly lower churning temperature.

2. "A slightly lower yeast and mold count results in butter made in the roll-less churn." This is abvious since the absence of rollers removes the stuffing box or boxing which is such an important source of contamination.

3. "The roll-less churn proved more efficient in re-working butter.

4. "The roll-less churn proved more efficient and satisfactory in churning and working small quantities of butter.

5. "The new type of churn showed no less ability to exhaustively churn cream: the time required to work the butter

was not greater than that in the combined churn and worker unit.

"The composition of the finished butter was quite as uniform. Comparisons of body and colour showed no difference between butter worked in either of the two units. Microscopic examination from a few churning gave no decided indication of any material disadvantage in the degree of moisture between the two churns."

Between 20 and 30 years ago the separate churn and worker unit ceased to be used to any considerable extent in the commercial creameries of the world, especially in the United States. The roll-less churn may replace this combined churn and worker unit because of the advantages suggested above. It is likely that since this churn is less complicated in its construction and since it operates on one speed, the installation cost of such a unit might be less than of the standard roll churn.

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"Failures are with the heroic minds the stepping stones to success."—*Haliburton*

A NOTE ON POTATO DISEASES IN INDIA

By

S. Chowdhury

Of all the crop plants none perhaps has received as much attention in the hands of the plant pathologists as the potato crop. Grown as it is at the present day almost all over the world, far away from its natural habitat in Tropical America, it is subject to many diseases due both to fungi and insects. Due to the ravages of one fungal disease, late blight caused by *Phytophthora infestans*, Ireland suffered such a loss that there was a famine in 1845. But inspite of the vast amount of research done in several places in Europe and America, more investigation is necessary and would pay, because some of these diseases create new situations due to local conditions and methods of control evolved in Europe may not always apply to a place, say, like Shillong (Assam).

In the seedling stage, there are two diseases which may do considerable damage. The disease due to *Rhizoctonia solani* Kuhn affects the root system and the basal stem generally and, if environmental conditions are favourable, loss due to destruction of plants may lead to complete ruin of the crop. It is necessary to determine these conditions under which the disease becomes epidemic and evolve suitable treatment of the soil so that the disease can be checked.

The second disease is the early blight which affects the plants when they are a little older. In the Patna potato-growing tracts this disease has been doing so much damage that it has become a matter of anxiety both to the agricultural department and the growers. This is primarily a disease of the leaves and the tender stem and effective control is possible if spraying or dusting is practised at the right moment. Careful observations about the time of first appearance of the disease together with carefully compiled meteorological observations would help in making a spray calendar.

Diseases of mature plants are many. Wilts due to *Fusarium, Bacteria, Verticillium, Sclerotium rolfsii*, and *Rhizoctonia* take a great toll of plants from fields. The wilt diseases are more difficult to control. If the source of infection is the tuber, which will have to be determined, then it can be suitably treated. If the source is soil, then varieties of potatoes that resist the disease will have to be evolved both by clonal selection and hybridisation, if the plant can be made to set seed. In the case of wilts or foot rots due to *S. rolfsii* it has been found that treating the base of the plants with some organic mercury compound pays in the long run. These and other methods such as rotation, manuring etc. will have to be tried and while it will not be possible to completely check these diseases, it will be possible to reduce the damage they do.

The late blight due to *Phytophthora infestans* is another disease that is difficult to control. Tons and tons of Bordeaux mixture have been used and while some amelioration from this dreaded disease has been possible due to this treatment, yet the cost involved and the vigilance necessary are so great that a search for more suitable methods is still going on. It has been proved that the source of infection is the potato tuber itself in which the fungus hibernates. Success in breeding resistant varieties has been reported and a permanent method of control seems therefore to lie in this. Trials with large number of varieties collected from as many sources as possible and subject to maximum infection may lead to finding such resistant varieties.

Virus diseases of potato plants which cause both degeneration of the crop and destruction of plants have been subject of much enquiry. There seem to be at least twenty virus diseases affecting this crop. In the case of those diseases where an insect vector has been definitely found, measures to check the disease and in other cases tuber-indexing of potatoes has done a great deal in minimising the spread of disease. The investigation on these diseases is of fundamental importance because the question of good seed supply is involved in it.

(*Continued on page 191.*)

STIMULATION OF ROOT FORMATION BY CHEMICALS

By

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Common experience has shown that the cuttings of different citrus species differ in the rate of rooting, as for example the lemons root more readily than the sweet oranges and these in turn root sooner than the grapefruit. It appears that a close relation exists between the degree of palisade development for each species and its ability to root from cuttings, because, the depth of palisade tissue expressed as a percentage of the thickness of leaf is about 20% greater in the lemon than in the sweet orange leaf.

An experimental study of vegetative propagation was begun in 1925 at the Boyce Thompson Institute for Plant Research in Yonkers, New York, for the purpose of finding the effect of peat moss and sand in rooting response of stem cuttings and many other phases of the project. In the experiments reported 91 varieties of plants including 46 genera were used and the work was done over a period of three years. Peat moss, sand and mixtures of these two in equal amounts constituted the media used in the experiments.

Hitchcock reports, "Contrary to the general belief that sand is the most suitable medium in which to root most kinds of cuttings it was found that this held true under the conditions given for only 6 out of 96 varieties tested. On the other hand a mixture of peat moss and sand proved to be far superior to sand inasmuch as 90 out of 96 varieties of cuttings rooted readily in this mixture". Such results are of particular interest because the general advice in text-books on propagation is to the effect that "Clean sharp sand" be used for rooting most kinds of cuttings.

While discussing the importance of plant hormones in horticulture, Professor Thomas of the Armstrong College writes, "The term Hormone was coined in 1906 to denote a substance produced in one part of an organism, but influencing in some definite way the functional activity of certain other parts to which it migrates." Hormones have the capacity to put in action or stop certain vital processes in plants or animals and thus play essential parts as chemical regulators of behaviours.

It has been found that a migratory growth substance is produced by the tip of the shoot (coleoptile) of a germinating oat grain. Experimental results show that oat shoot soon ceases to grow if the tip is cut off, although the region of growth is resumed if the tip is stuck into position again by means of gelatin. This growth substance may be described as a hormone since it is produced by the tip and migrates downwards to the enlarging region where it stimulates growth in length. It appears that the stimulation is brought about by an increase in the extensibility of the cell wall. Kogl proposed the term "Auxin" to describe substances that can stimulate cell enlargement in this way.

Thomas remarks "Owing to migration from the regions of manufacture or storage, hormones may be present in all parts of a growing member, but in some parts of plants they may be rendered inactive possibly by conversion into esters." Fitting's experimental findings also indicate that pollen grains are rich in hormones. Kogl obtained in crystalline form three naturally occurring auxins namely auxin-a and auxin-b occurring in higher plants and the third hetero-auxin produced by fungi and bacteria such as may be present in natural humus.

Kogl assigned the following formulæ to the three auxins: —

Auxin-a ($C_{18}H_{32}O_5$), auxin-b ($C_{18}H_{30}O_4$) and hetero-auxin ($C_{10}H_9O_2N$). Auxins can be applied by mixing with lanolin (sheep's wool fat) so that they may penetrate through

the outer coverings of the plant. The preparation of any of the three auxins from products of living organisms is a long and difficult process. It is therefore fortunate that B-indolyl acetic acid (identical with hetero-auxin $C_{10}H_9O_2N$) has been synthesigned by chemists. Laibach observed that the application of lanolin paste containing heteroauxin to plant organs caused new cell formation in pith and cortex. The first un-ambiguous evidence of the root forming action of a chemical preparation was given by Went, who stimulated root formation in certain plants and gave the name "Rhizocaline" to the root forming substances.

Several experiments have shown that the root forming hormone is manufactured in the leaves or stored in the buds, from where it migrates in a morphologically downward direction and stimulates root formation below, such as at the base of a cutting. Thimann and Koepfli observed that synthetic B-indolyl acetic acid was extremely effective in stimulating rooting. The calculations from experimental results indicate that under favourable conditions over two million new roots in pea seedling-stems, can be initiated by 1gm. of B-indolyl acetic acid. Laibach also showed that B-indolyl acetic acid (heteroauxin) was very effective. He reported that rooting was locally promoted by smearing the mid ribs of under surfaces of leaves or portions of leaf-stalks or stems and that roots sometimes appeared below the region of application.

Hitchcock and Zimmerman recommended a method for applying the root forming chemicals with lanolin by mixing the synthetic compounds with lanolin in correct proportion, melting about half the lanolin by immersing the vial in warm water and then applying a small amount of the semi-molten mixture to a stretch of $\frac{1}{2}''$ to $\frac{3}{4}''$ at the basal part of a branch-shoot $2''$ to $5''$ in length. In the case of woody plants slits were to be made in the bark in order to facilitate the entry of the paste. Later on Tincker drew the conclusion that the paste method proved ineffective with certain woody species, and at present there seems to be more promise of success in treating plants or cuttings with dilute solutions containing

auxins. Accordingly Zimmerman and Hitchcock discovered that small volumes of dilute solutions of certain substances (e.g. B-indolyl acetic acid, indolyl butyric acid and a-naphthalene acetic acids) were sufficient to promote rooting of cuttings, including certain woody ones.

Thomas remarks, "The preliminary work on holly and other plants indicate that placing cuttings in relatively high concentrations for a short period is likely to prove the most efficient process; but greater care will have to be taken not to poison plants by too prolonged treatment". According to Biak and Halma of the University of California, treatment with indole—3—acetic acid (hetero-auxin), may minimize or even overcome the difficulty in response to rooting exhibited by many citrus species and other sub-tropical plants.

Among the gaseous root forming substances, carbon monoxide gas deserves special mention because it not only hastens the growth of roots but actually causes roots to form in places where they do not normally occur. Zimmerman, Crocker and Hitchcock found that carbon monoxide gas induced the formation of adventitious roots where they do not normally occur on stems of woody and herbaceous plants. Carbon monoxide gas used in the experiments was made by heating 100gms. of oxalic acid with 300c.c. of sulphuric acid and collecting the gas over water. The gas was scrubbed with soda lime, potassium hydroxide and barium hydroxide until it was approximately 96% pure carbon monoxide. The plants were exposed to gas under bell jars for treatment. Of the 80 species of plants 27 showed definite root effects from exposure to carbon monoxide gas. The most evident responses were :—(*a*) Initiation of roots from young tissues on the stem, (*b*) Stimulation of pre existing root primordia on the stem and (*c*) Secondary soil roots changed in their response to gravity.

Young roots grown in carbon monoxide gas appeared to have an abnormal supply of root hairs and the first signs of stimulation were noticed at the region of elongation. In several cases more than the normal numbers of branches occurred on treated plants. Under proper moisture and

temperature conditions, carbon dioxide gas actually induced roots to form. Zimmerman, Crocker and Hitchcock therefore remark, "Since no other organs were induced, it appears that this gas is a specific for roots". Besides this gas, ethylene, propylene and acetylene are examples of other growth promoting substances. In an attempt to explain the action of ethylene on plants, Michener of California Institute of Technology states, "The experiments with oat and pea seedlings indicate that ethylene causes an activation or accumulation of food factor or some other factor promoting growth".

The following sixteen root-forming substances have been reported from the Boyce Thompson, Institute Laboratory as the important ones : -

1. β-indolyl-acetic acid
2. Indolepropionic acid
3. Phenylacrylic acid
4. Phenylpropionic acid
5. Carbon monoxide
6. Ethylene
7. Propylene
8. Acetylene
9. α -naphthaleneacetic acid
10. β-naphthaleneacetic acid
11. Acenaphthyl—(5) acetic acid
12. Indole butyric acid
13. Phenyl acetic acid
14. Floureneacetic acid
15. Anthraceneacetic acid
16. α -naphthylacetonitrile

While testing the effects of chemicals (9) to (16), compounds were used as distilled water solutions or mixed with lanolin. In a few cases where cuttings were involved, dilutions were made with Knop's solution. The cuttings were placed in flasks so that the basal ends were immersed in the solutions. Water solutions were also introduced into the stem and petioles of growing plants by means of glass tubes drawn to a capillary at one end. Lanolin preparations were applied locally by rubbing the mixture on stems or leaves with a glass rod The usual concentration range was between 0·01% to 2%.

The above mentioned eight compounds (9) to (16) caused unusual activity when applied to growing plants. α -naphthaleneacetic acid and indolebutyric acid were specially effective for initiating roots on both stems and leaves. If the plants were kept in a glass case after treatment, the new

roots forced their way through the epidermis and into the humid atmosphere. The time required for roots to make their appearance varied with the chemical substances used, the concentrations, the species of plants and the exact place on the plant where the material was applied.

Growth substances applied to one side of active shoots caused negative or positive bending according to the concentrations of the chemical and the plant species. Positive bending was assumed to be due to retardation in normal growth rate or injury to the tissue where the chemical was applied. Negative bending was due to acceleration of growth rate on the treated side of the stem. Tomato stems showed negative bending with 2% in lanolin of indoleacetic acid, indolepropionic acid and phenylacetic acid, while the same concentrations of naphthalene-acetic acid and indolebutyric caused a positive response It is therefore desirable to determine intermediate concentrations which do not cause bending in either direction, for example 0·5% of indoleacetic acid in lanolin while increasing the diameter of sweet pea and Windsor bean stem-tips did not cause bending, although slight lower concentrations caused negative bending. Epinasty of leaves was also induced by the application of these substances with lanolin or by injecting the water solution by means of glass tubes. Pulvinal cells of *mimosa pudica* were rendered inactive when treated with lanolin containing 0·1% of α -naphthaleneacetic, indolebutyric or indoleacetic acid, that is the pulvinal, tissue was rendered incapable of responding to external stimuli such as touch or sudden change in temperature. This condition suggests local anaesthesia.

Zimmerman, Hitchcock and Wilcoxon have discussed the responses of plants to growth substances applied as solutions and as vapours in a recent report. According to these workers, 29 compounds which were physiologically active as plant growth substances when applied in solutions were found to be active also, when used as vapours. In several experiments Curtis increased shoot and root growth of woody cuttings by treatment with potassium permanganate. As a general conclusion it can be said that α -naphthalene acetic acid and

indolbutyric acid are the most effective root forming substances yet discovered.

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Note on Potato Diseases in India

(*Continued from page 184.*)

Diseases of tubers are of two kinds, those affecting them while they are still in the soil and those affecting in storage. Here again fungi like *Rhizoctonia* and *Fusarium* and also bacteria are responsible for much of the damage. The question of potato storage is an all India problem and while explanations have been given regarding many of the ills with which the tubers suffer, yet no suitable methods for storage have been found out. The chemists claim that the many rots are due to enzymes and high summer temperature, while the bacteriologists have associated many bacteria with the trouble and the mycologists have isolated many fungi from rotted tubers. In spite of all this information, we are yet in the dark as to what should be done to minimise the trouble. Research more along control lines should at once be undertaken.

LIME IN ITS RELATION TO PLANTS

S. Chowdhury

'Lime and lime without manure, makes both farm and farmer poor.'

It is impossible to say how long the value of lime in agriculture has been recognised, but classical literature speaks of its use by the Romans and it may be sufficient to say that it has always been considered essential to good husbandry. Loudon writing about lime says 'Next to farmyard dung, lime is in most general use as a manure though it is one of a quite different character and when judiciously applied..... its effects are much more lasting and in many instances, still more beneficial than those of farmyard dung.'

Functions of Lime in the Soil.—Lime is not truly a manure. It supplies neither nitrogen, phosphoric acid, nor potash. Too often it has been considered a 'cure all', capable of supplying the various requirements for the continued production of large yields. The factors which influence soil fertility are of three kinds, *viz.*, physical, chemical and biological, and the presence of a sufficiency of lime in the soil, is essential to maintain normality in these three directions. Although lime alone will neither maintain nor materially improve run-down soils, any practical scheme of permanent soil improvement must include liming as one of its essentials. The following notes will serve to show how lime functions:

(1) Lime supplies a food constituent essential to plants and, by way of the plants, to animals. Good crops and healthy livestock cannot long be produced on land suffering from marked lime deficiency.

(2) Lime serves to keep the soil in a sweet condition. Although there are certain plants which thrive on sour soils, they are not generally of economic interest. The excess of acids produced in the soil by the breaking down of organic matter must be neutralized by lime in order to keep the soil in a suitable condition for plant life.

(3) Lime acts chemically upon vegetable matter in the soil and hastens ammonification and nitrification in the soil. Cases are on record where the efficiency of certain forms of organic nitrogen in soils has been increased from 2 to a dozen times solely as the result of a single heavy application of lime.

(4) In soils which contain some amount of potash present however in an unavailable condition, lime serves to break up the insoluble potash compounds and to set free potash in a form which can be readily used by plants.

(5) Lime also acts upon unavailable phosphates of iron and alumina in the soil and converts them into phosphates of lime which are valuable in plant nutrition.

(6) Lime in the soil ensures the best utilisation of soluble acid manures such as super-phosphates, dissolved bones and sulphate of ammonia, and it prevents, any detrimental results from the acid nature of these manures. In the absence of lime in the soil, soluble phosphate combines with iron and alumina and forms compounds which are not easily available and the advantage of the soluble phosphate is lost.

(7) Lime has very beneficial effects upon the physical condition of the soil, these being most marked in clays where the use of lime gradually renders the soil more amenable to cultivation. The effect of lime on compact clay or silt soils is to cause several small particles to draw together by the pr cess known as 'flocculation'. As a result air more readily enters the soil, whereby the conditions are usually rendered less favourable for the destruction of nitrates, since denitrification is essentially an anaerobic process. Drainage is assisted and more opportunity is given to the farmer to work the land. On light soils lime tends to bind the soil particles more closely together and so makes the soil less susceptible to drought.

(8) Lime by producing a sweet soil assists in the development of those organisms which convert the organic matter of the soil into soluble plant food. The presence of acid in the soil prevents the action of such useful bacteria as those which fix nitrogen, and of others (the nitrifying bacteria) which convert ammonia into nitrates. The Ohio Experiment Station reports finding nearly twice as many bacteria in the surface soil of a limed plot as in that of an unlimed plot.

(9) Organisms such as fungi which may injure crops, appear to be less active in soils well supplied with lime. Lime lessens the club-root disease of cabbage and other cruciferous plants.

Loss of Lime from the Soil:—Sir John Russell says 'Of all soil constituents none is so seriously liable to loss as lime.' Lime, as an essential plant food, is removed from the soil by crops grown thereon, but the percentages of lime found in average crops are so small that the loss from the soil in this direction is not very marked. On the other hand, however, the loss of lime by actual drainage from the soil is very considerable and may amount to several hundreds of pounds of lime per acre per annum. Water percolating through the soil becomes charged with carbon dioxide gas and is capable of dissolving lime from the soil, and so losses occur by drainage. Such losses occur to a larger extent in the lighter soils, and the use of farmyard manure and other organic manures tends to diminish the loss by rendering the soil less susceptible to drainage. The continuous use of sulphate of ammonia is an important factor in depleting the lime content of soils. The use of nitrate of soda tends to diminish the loss of lime from the soil. The following table will be of interest showing as it does the comparison between the losses of carbonate of lime from the soil under different treatments in the Broadbalk wheat field at Rothamsted :—

Calcium Carbonate in Broadbalk Wheat Soils
First Depth (1 to 9 inches)

	Per cent in fine dry soil.		Loss per acre per annum. Lbs
	1865	1904	
Unmanured	4·54	3·29	800
Complete minerals and 275 lbs. of nitrate of soda..	4·29	3·36	564
Complete minerals and 400 lbs. of ammonium sulphate	3·82	2·25	1010
Dung	4·20	3·28	590

Lime in Soils:—One is often asked what percentage of lime or limestone a soil should contain for economic agricultural practice, and it may be admitted that it is somewhat difficult to answer the query because there are other factors in the chemical composition of a soil which affect the value of the lime content. One of the most important of these is the percentage of magnesia which is present. As Dr. Voelcker pointed out in his address to the London Farmers' Club in 1924, a soil containing 0·5 per cent of lime and 1 per cent of magnesia might be deficient in lime, whilst a soil with the same lime content but containing only 0·1 per cent of magnesia might have sufficient lime. The reply to the question can be well summed up in Dr. Voelcker's words a follows :—

"Assuming that there is no excess of magnesia over lime 0·75 per cent of lime in a soil may be taken as ample sufficiency. I should question, indeed whether 0·5 per cent of lime would only imply actual deficiency, but anything below 0 5 per cent I should look upon as a dangerously low quantity."

Duration of the Effects of Lime :—The rapidity with which the effects of lime will be shown and also the duration of these effects will depend largely upon the nature of the soil and upon the method of application of the lime. Lime applied in a fairly ground condition will act more quickly and its effects will probably not be so durable as those from lime applied in lumps. Cases are well known where the effects of lime have been noted for very long periods, twenty years or more. In fact it is quite reasonable to say that many farmers are still producing crops with the assistance of lime applied many many years ago. It seems difficult to reconcile this with the compensation allowed by Hall and Voelcker for lime applications which is limited to seven years on grass land and five years on arable land. Actual improvement in the soil conditions, however, is the factor which must be considered, and experience demonstrates that continued improvement for about 8 or 10 years may be expected from the application of one or two tons of ground lime to soils deficient in this respect.

Lime and Crops :—Lime is essential to economic agriculture but some crops are more dependent upon a plentiful supply of lime than are others. For example potatoes are practically independent of lime and, in fact, excessive lime tends to produce poor quality potatoes and also encourages scab diseases. Other crops which appear to tolerate some degree of lime deficiency in the soil are rye, oats and alsike clover. On the other hand, lime is very necessary to the growth of lucern and healthy crops of legumes generally, and barley, maize, and root crops cannot usually be successfully grown on sour land.

Form of Lime to Use :—Calcium is used on the soil in the form of calcium oxide or quicklime (CaO), water-slaked lime ($Ca(OH)_2$), air-slaked lime ($CaCO_3$), ground limestone and marl. The application of any of these is usually called liming the soil. Owing to differences in the molecular weights of these compounds of calcium it requires more of some forms than of others to furnish the same amount of calcium. Approximately equivalent quantities of some of the common forms when fairly pure are :

Quicklime	56 pounds
Water-slaked lime	74 "
Air-slaked lime, marl and ground limestone	100 pounds

Quicklime and the hydrate when added to the soil, eventually assume some of the more insoluble forms of combination or remain as the carbonate never being present as the oxide. It is always desirable to have present in the soil at least a small amount of calcium carbonate.

Caustic Limes :—Quicklime and water-slaked lime have a markedly alkaline reaction and hence neutralize quickly any active acidity that may exist in the soil. They act quickly also in liberating plant food particularly nitrogen. Some soils respond more rapidly to quicklime or water-slaked lime than to carbonate of lime, especially when the carbonate is in the form of marl or ground limestone, these substances never being in such a finely pulverized condition as is caustic lime. The use of the caustic forms of lime has been said to result

in the loss of nitrogen by the too rapid decomposition of organic compound.

On clays the granulating effect of caustic lime is more marked than that of the carbonate, and for this reason the former has a distinct advantage for use on heavy clay.

Carbonate of Lime :—Air-slaked lime has the advantage of being in a finely divided condition and does not produce the injurious action on organic matter that is sometimes attributed to caustic lime. Its effect on the granulation of clay soils is probably less pronounced than that of caustic lime.

Marl differs from air-slaked lime principally in its property of being in a less finely pulverized condition. It acts less quickly than does caustic lime. Marls vary greatly in composition; the carbonate of lime in marl may vary from 5 or 10 to 90 or 95 per cent. in different samples. The material generally sells at a higher price than ground limestone even though it is of no great agricultural value.

Ground limestone is one of the most agreeable forms of lime to handle. Whereas both the burned and hydrated lime are caustic and will burn the skin, particularly in warm weather the limestone is harmless and can be handled freely. It is partly because of this desirable feature that ground limestone is so extensively used by farmers.

The effectiveness of limestone depends not alone on composition but also on fineness of grinding. However, it is doubtful whether there is any advantage in making it finer than is required to pass through a sieve with 50 meshes to the linear inch. Limestone particles passing a 50 or 60—mesh sieve will largely become effective the first year. Those coarser than this are slower in action but more lasting in their effect on the soil.

Lime in some Manures :—Lime occurs in certain manures such as basic slag and steamed bone flour. The lime of phosphatic manures generally is in combination with phosphoric acid as phosphate of lime, but it is not uncommon to meet farmers who believe that the use of basic slag does away with the need of liming. Such manures are undoub-

tedly the best sources of phosphoric acid for use on land suffering from lime deficiency but they have little value for neutralizing any appreciable amount of excessive sourness.

Amounts of Lime to Apply.—The amounts of true lime which should be applied are, of course, dependent largely upon the nature of the soil and the degree of its sourness. Small dressings of 10 to 20 cwt. of ground lime, or 15 to 30 cwt. of carbonate of lime may be useful to maintain sweetness in an ordinary soil, but where the soil is definitely acid much larger amounts may be required initially. Extensive experiments on this question have been carried out at Woburn and the general conclusions to be drawn from the results of these are that for land very deficient in lime 2 tons of burnt lime or the equivalent in limestone ($3\frac{1}{2}$ tons) should be used. Increased improvement resulted as the lime applications per acre were raised from 10 cwt. to 2 tons and sometimes even to 3 tons, but 4 tons have proved excessive.

Time of Application of Lime:—On arable land a suitable time for the application of lime is during the time of ploughing. The lime should be applied broadcast to the field, and not to be put in the row with the seed. The application should be made after ploughing rather than before. The field should then be thoroughly ploughed, disked or harrowed in order to mix the lime thoroughly with the top soil. The temporary injurious results which sometime follow the heavy application of lime can usually be avoided by thoroughly incorporating the lime with the soil.

Applications of dung and lime should not be made at the same time. Lime should be applied as far removed from the potato crop as possible.

Lime and Manures: –It is well known that acid manures such as dissolved bones, super-phosphate and sulphate of ammonia will only give their best results on land containing a sufficiency of lime and, indeed the continued use of these manures on land without use of lime will result in infertility.

There are several points of further interest with regard to the use of lime with other manures. It is well known

(Continued on page 201.)

Book Reviews

The Annual Review of Biochemical and Allied Research in India. *Vol. IX 1938.*

I have perused some books dealing with Biochemical researches. In fact, quite a number are published during the course of a year. But either they are too elaborate or so dull, that a busy man cannot find the time to read them or benefit by their perusal. The above book however is quite different from the rest, in as much as it gives in crisp and terse language the manifold researches carried out successfully by painstaking and able research scholars.

Biochemistry, it is needless to mention, is a science closely allied to human life. Therefore the various topics expatiated on in this book should be of vital interest to the layman as well as to the scientist.

As I have stated before, the language and style of presentation are very simple and one cannot help reading it through, when once he commences it. Interesting facts, results, statistics of the experiments are presented in a very handy form. The actual experiments are presented so clearly that any scientist can perform them for himself and verify the results. Further, the careful study of the book is sure to widen the horizon of the reader's knowledge and give him a fairly clear insight into the various topics touched upon. The scientist of today, cannot tolerate stagnation. He must be constantly on the lookout for fresh sources of increasing his knowledge. This cannot be done better than by a thorough perusal of this useful book.

This book brings the scientist working at home or in his laboratory into intimate contact with eminent research scholars, who it seems are daily widening the scope of Biochemistry in the realm of science.

The book is nicely and strongly bound and is of a handy size, not too bulky either and can be easily carried in the coat pocket. The various references show what great pains have been taken by the Society of Biochemistry of India to present

authoritative facts to the reader. The reader if he can afford it, must look up the books referred to. By doing so, he will come across other more relevant facts and details of the experiment, that could not be included in such a small book.

The review also shows the progress made and the wide scope of work in the realm of Biochemistry. One interesting feature is that it is not confused by narrow ideas of Provincialism. Due prominence is given to India-wide scholars working in every nook and corner of the motherland. This should be a great stimulus to the workers whose experiments are discussed in this book.

In conclusion, I cannot but help commending highly this valuable book to all interested in Biochemical Research in India. Every scientific laboratory must possess a volume of this book for the benefit of its readers.

I shall now leave it up to the readers to judge its merits by perusing it.

C. O. DAS.

The Chaubattia Hill Fruit Station Report for 1937-38

The reports of the horticultural, entomological, mycological and soil chemical sections are combined under one cover in the order given. Horticultural experiments on budding, thinning, ringing and stock selection are being carried on with full reports to be expected in the future. Stocks were divided into three classes according to behaviour as, vigorous, semi-dwarfing and dwarfing. As a result of thinning no difference in gross weight of fruit was found. Ringed trees produced the greater number of flowers. September was determined as the best month for budding and March for grafting. Inarching of root stocks for the purpose of rejuvenation of old trees has not shown promise and the use of the hormones, B. indolyl acetic acid, hortomone A. and Auxilin have not shown increased root growth. The best rejuvenation method so far tried has been heading back plus artificial fertilizer.

The Entomological section reports work on the control of the apple root borers, wooly aphis and scale. Paradichlorobenzene is most effective against borers in a humidity of 20

per cent. Root stock selections are being made for resistance against the attacks of wooly aphis and up to this time Malling Type XIII has shown itself significantly better than any of the others. Lime-sulpur and soft soap gave the best control for scale.

The Mycological Section reports work on collar rot (*Rossellina* sp.), stem brown, or die back (*Botryosphaeria ribis*, Gross and Duggar), pink disease (*Corticium salmonicolor*, B. and B.), hairy root, a *Phillosticta* sp., fire blight and storage diseases. For the collar rot no resistant stocks have been found and the application of chemicals has not proved effective. Red lead and copper sulphate in linseed oil applied to the pruned surfaces has proved best for the die back. The storage diseases are being studied with a view to their control.

The Soil Chemical Section announces the continuation of the analysis of soils and the intention of making a complete analysis of the soil of the entire orchard.

E. F. V.

(*Continued from page 198.*)

that lime should never be used along with farm manures or any organic manure containing nitrogen, as by doing so the valuable nitrogen is often lost. Such manures, therefore, as guanos should not be used in contact with lime. It is not advisable to mix quicklime with any manure and certainly not with those containing nitrogen. Neither lime nor limestone should be mixed with superphosphate as such a mixture causes the water soluble phosphates of the superphosphate to revert to a less soluble form; neither should be mixed with sulphate of ammonia.

Dangers of Excessive Liming :—(1) It has been reported by Gile that when lime is present in sandy soils in excess, it may be a cause of pineapple chlorosis.

(2) The use of excessive amounts of lime have been found to encourage a disease of tobacco known as tobacco root rot which is caused directly by a fungus...*Thielavia basicola*.

(3) The dry spot of oats has also been recently observed in Europe to occasionally follow the use of lime.

A STUDY OF AN IDEAL VILLAGE IN THE CENTRAL PROVINCES AND BERAR

BY

M. A. KOLKHEDE, B. SC. (*Agr*).

(Continued from the previous issues)

CHAPTER III

Co-operation and Co-operative Societies :—It is the wonderful form of co-operation which has made this village an ideal one. All the prosperity of the village is due to different co-operative societies which are working very smoothly. Some account of these societies will give an idea about the scope for co-operation in the movement of rural reconstruction. The first and the most important co-operative society is the Kisan Stiti Sudharak Sanstha ; the account of which is given below :—

Kisan Stiti Sudharak Sanstha :—(A society for the improvement of farmers) :—

I. *Establishment* :—In order to abolish the different parties and to organise the farmers in the village, the society was started on the 1st March, 1922.

II. *Objects* :- Every society must have some good object on which it can proceed to do some good work. Accordingly the following objects were laid before the society :—

1. To improve the land by proper manuring and good cultivation.
2. To increase the efficiency of cattle by scientific breeding and proper feeding.
3. To introduce improved seeds, implements and artificial fertilizers.
4. To start different co-operative societies like 'Crop Protection Society', 'Co-operative Credit Society', *etc*.
5. To check the litigations and to settle them in the village itself.

6. To teach economy to the farmers and thereby improve their financial position.

III. *Constitution* :—Every farmer who agrees to fulfill the above objects can be a member of the society. Afterwards the right of membership has been extended to labourers also. Women are also included in the members. To facilitate the smooth working of the society, every year a committee is elected. The following are the office-bearers of the committee :—

1. President, 2. Vice-President, 3. Secretary, 4. Treasurer, 5 Auditor and 6. Advisor. This Committee is called the 'Governing Council' which carries on the working of the society.

IV. *Meetings* :—Every year there is a general meeting of all the members, to review the working of the last year's business and to lay a programme for the next year. Besides this meeting, several other meetings of the office-bearers are held to execute the programme laid by the general meeting of all the members.

V. *Membership:*—Every member who cultivates his land has to pay As. two per acre to the society. In case of bad financial year, the members can postpone their subscription to the next year. There is no fix subscription for the labourers; they can pay any amount according to their will.

VI. *Capital:*—The capital of the society has been accumulated from the following sources :—

1. Acre fund : It is a sum which is contributed by the members according to their landed property. Every year, they pay two annas per acre on the cultivated area. This amount, the number of members and the profits got are given in the following table:—

Items	1922-23	1927-28	1936-37
Number of members	51	103	124
Acre fund	573-6-0	341-11-0	586-8-0
Net profit	745-3-9	766-15-6	359-5-1

2. Deposits :—All the members, the remaining villagers and the other co-operative societies in the village deposit their money in this society. In 1923, the rate of interest on current deposits and fixed deposits was 4 per cent and 5 per cent respectively. In 1925, the rate was increased to 9 per cent for the religious deposits. In 1927, it was decided to give 6 per cent interest on all the fixed deposits. But the present rate (in 1937) is 3 per cent on the current deposits and 4 per cent on the fixed deposits. This year (*i.e.* 1937) the society has Rs. 1,785-11-3 as deposit from the villagers and Rs. 4,870-2-0 from the different societies in the village.

3. Interest on the loans:—The society gave a cheap credit to its members, to save them from the clutches of the money-lenders. But in 1928, a separate society, called 'The Kisan Pedhi' (Farmers' Co-operative Society) was started, and this function of giving credit to the members was transferred to that society. The amount of credit given and the interest got in some years is given in the following table:—

Items	1922-23	1925-26	1927 28
Number of debtors	6	26	43
Amount of loan	1983 0-3	3171-8-0	6884-0-3
Interest earned	52-15-9	291-4-6	318-5-6

4. Sale of Improved Seeds :—The society stocks the improved seeds from the Rao Bahadur's demonstration plots and from the fields of good farmers. The following table shows the amount of improved seeds sold during some of the years:—

Items	1922-23	1927-28	1936-37
Cotton—Roseum	2106-0-0	1874-8-0	296-6-6
Cotton—Verum	..	..	400-4-0
Itki Pea	..	8-7-0	.
Saoner Juar	..	10-0-0	
Ramkel Juar	..	2-0 0	..
Copper-sulphate	5-0-0		5-13-6
Total	2116-0-0	1895-15-0	702-8-0

Nowadays the sales of improved seeds are decreasing because, now, almost all the farmers of the village and also of the surrounding villages have got their own stock of seeds.

5. Sale of Improved Implements :—The society also earns a lot of profit on the sale of improved implements. Upto this time it has sold about 600 iron ploughs. 80 iron chairs, 4 winnowers, 7 stone-rollers, 800 different spare parts of the ploughs and 10 iron bullock-carts. The following table shows the amount of sale of the improved implements, in some of the years:—

Items	1922-23	1923-24	1927 28
Iron ploughs	2452-0 0	3919-0-0	2760-0-0
Iron plough chains	.	29-0-0	38-12-0
Winnowers	251-0-0	..	..
Stone-rollers	..	..	..
Spare parts of ploughs.. ..	25-7-9	35-10-0	147-14-0
Iron bullock-carts	501-0-0	224-0-0	..

Some of the important activities of the Society

Demonstration plots:—These plots are of great value to show the cultivators, the result of improved varieties of crops and the effect of different manures. They also serve very useful purpose in the production and distribution of pure seed. Besides this they conduct various experiments to ascertain the 'Local economic value', of the recommendation made by the Agricultural Department. Some experiments were conducted to ascertain the economic spacing and manuring of cotton. After three years of trial, the economic spacing was found to be 18 inches between rows and 12 inches between each plant. As regards manuring, the economic treatment was found to be 20 cart-loads of urine-earth and 112 lb. of Sodium nitrate. As regards the varietal experiments, of cotton, Roseum gave the highest out-turn, and in case of varietal experiments of juar, Saoner gave the highest yield.

Publications :—From the very beginning, the society was fully aware of the ways of educating the villagers. To achieve this aim, it distributed several pamphlets, giving detail information about the society. All these pamphlets were distributed freely to the cultivators, in different exhibitions and fairs in the locality. The pamphlets gave them the idea of the importance of co-operation and co-operative societies. As a result of this stimulus, some co-operative societies were started in some of the surrounding villa es, but unfortunately failed, due to lack of proper guidance. To inform the public about the activities of the society, its annual accounts and work were published in local news-papers and magazines. In this way, the usefulness of having such society in each village, was known to the public.

Meetings and Lectures :—From time to time, the Secretary of the society, arranges for magic-lantern shows, which are very useful in influencing the ignorant and innocent minds of the villagers. Up to this time, their have been about forty magic-lanterns shows, giving information about improved agricultural implements, different crops, improved animals, sanitation, co-operation etc. As the rural reconstruction work in the village is known to many of the officials and non-officials, they always go to see the work. During their visit, they are shown the various activities and the societies in the village during the day time and are requested to advise the villagers at night in a general meeting.

Whenever officers of the Agricultural, Veterinary, Medical, Revenue and Co-operative Departments, go there, they are always requested to give some suggestions as regards the further improvement of the villagers, in a general meeting. Thus up to this time, there has been about 150 lectures on co-operation, sanitation, education, agriculture, etc. in the village.

Exhibitions :—Agricultural exhibitions are very useful in rural improvement. To encourage the farmers in the village, therefore, various samples of improved varieties of cotton, juar, groundnut etc. are sent to all the exhibitions in the province. For the best samples, many of the villagers secured prizes in different agricultural exhibitions at Ellichpur,

Bairam and Rinmochan fairs. The society took every advantage of these big fairs in advertising its work. It also kept some cups and medals for plough races which were held during these fairs.

Demonstrations :—To improve the condition of the surrounding villagers, the society arranged for several demonstrations some of which are given below :—

In 1924 an Agricultural Show was arranged to show the superiority of the iron ploughs over the wooden ones. At the same time, a ploughing competition was also arranged in which sixteen ploughs took part. The owners of the best pairs and efficient drivers were given prizes worth Rs. 68. On this occasion about 2,000—3,000 villagers were present.

In the year 1926, the society arranged for a bullock race to induce the cultivators to produce better trotting bullocks. In this race, 139 pairs took part. The best pair covered the distance of two furlongs within two seconds only (*i.e.* the speed was twenty-three miles per hour). The first, the second and the third pairs were given prizes worth Rs. 40.

In the year 1929, an exhibition of handicrafts was held in which most of the schools in the district took part by sending various beautiful exhibits. At this time, a mentling and dismentling of a plough competition was held for the students. The student, who assembled and dismantled the plough in the shortest time, was given a silver medal. In the same way the society, always arranges for agricultural exhibitions and magic-lantern shows which induce the cultivator to improve their condition still further. Thus the society not only takes interest in the members alone but also in the cultivators of the surrounding villages.

Introduction of Single Mark Boundary System.—Due to an old system of marking boundaries of fields, litigations are the common feature of a village. Generally the boundaries are marked by putting small heaps of earth on the corners of the fields. Some mischievous cultivators shift these heaps from place to place and try to increase the area of their fields. To check this, in 1924, the society measured all the fields and fixed the boundaries with permanent stones. This system

has now completely checked the problem of encroachment of area and have saved the troubles and money of repairing the 'Varalies' (small heaps of earth).

Suggestions given by the Society.—On various Laws passed in the Legislative Assembly, and reports published by the Government for the farmers, the society, always expressed its opinion and gave some suggestions, some of which are given below :—

1. In 1926, the society supplied some information to the Royal Commission on Agriculture.

2. In an Agricultural Exhibition, held on 9th September, 1925, it gave some suggestions to the Deputy Commissioner and Agricultural Department, as regards the improvment of villagers. On 27th October, 1937, it also gave some suggestions to the Provincial Board of Agriculture, as regards the possibilities of irrigation in Berar.

3. On 5th October, 1928, it requested the Provincial Government to amend the 'Cotton Market Law' for the benefit of the cultivators.

4. On 2nd October, 1929, it replied to the questions asked by the Banking Inquiry Committee.

Almost all the officials and non-officials in the Province are fully aware of the work done by the society. Many of them have personally gone to the village to see the working of the society and have expressed very satisfactory opinion about it. Some of the extracts from the remarks of these people are given in Appendix No. 4.

Financial position of the Society.—The financial position of this society is quite sound and today, (1937) has a balance of Rs. 13,616-15-7, at its credit, the details of which are given below :—

	Rs.	a.	p.
Deposit in Co-operative Central Bank, Daryapur ..	3,403	7	9
With Kisan Co-operative Shop	3,370	14	0
With Kisan Pedhi	391	6	0
In Postal Saving Bank, Itki	3,989	7	11
Loans to the farmers	713	9	0
Loans to other societies	766	9	6
Cost of implements and seeds in stock ..	881	4	9
Cash with the Secretary	100	4	8
Total	13,616	15	7

Kisan Co-operative Shop

(Farmers' Co-operative Shop.)

This is one of the special features of co-operation in the village. According to the resolution of the 'Gaon Sabha Manda' (General Meeting of the villagers), the shop was started in 1934, in order to supply almost all the articles at a cheaper rate. In the beginning the 'Kisan Stiti Sudharak Sanstha' gave a capital of Rs. 3,370-14-0. But now, they have also introduced a share system to increase the capital and to allow the credit sales. Each share is of Rs. 5. The share-holders are given credit only to the extent of half the value of their shares.

There are two salesmen, who keep-up the accounts and also do the purchase, with the help of the Secretary. Each of them is paid Rs. 8 per month. Almost all the necessary things like grains, spices, oils, stationery, cloth etc., are kept for sale at a very moderate rate. They charge only one anna per rupee as profit, while a village 'Bania' charges from 25 to 75 per cent. Moreover the shop purchases all the goods at a wholesale price and has not to pay any rent. In the prices of many articles, it is therefore found that the prices at the shop are less even than the town shops. Another great advantage of having the co-operative shop is that, the villagers get the goods of superior quality and of correct weight, which is not the case in a 'Bania's shop.

During the year 1935-36, the shop sold goods worth Rs. 4,700 in cash and Rs. 1,187 on credit. The shop supplies goods of superior quality and of correct weight not only to the villagers but also to the people of the surrounding villages, who come there on the Bazar Day. The stock of the goods and the accounts are checked from time to time by the Secretary and the President of the Society. Last year (1935-36), the shop earned a profit of Rs. 370-8-9, out of this, Rs. 192 were paid to the salesmen, thus leaving a net profit of Rs, 178-8-9.

Kisan Pedhi

(Farmers' Co-operative Credit Society.)

This society was started in 1928, to save the poor farmers from the clutches of the money-lenders. It is financed partly by the Co-operative Central Bank and partly by the Kisan Stiti Sudharak Sanstha.' It advances loans to its members at a moderate rate of interest, varying from 9 to 12 per cent, and also serve as saving bank for the farmers. The members of the working committee being the residents of the same village, very well know the character and financial position of each member and can therefore, advance loans only to a limited extent. Moreover, the loans are advanced on the understanding that they are to be paid just after the harvest of the crops. The following balance sheet of the society on 30th June, 1936, will show the financial position of the society :—

Liabilities.	Rs.	a.	p.	Assets.	Rs.	a.	p.
Reserve fund ..	2,427	9	7	Shares of the Provincial Bank	610	8	11
Loan from the Central Bank	1,465	0	0	Miscellaneous ..	10	0	0
For federation ..	59	0	0	Loans to the members ..	2,438	3	3
Deposits	2,458	12	9	Deposit in the Central Bank	2,495	5	6
Fixed Deposits ..	2,443	5	0	Deposit with the Registrar ..	2,273	14	11
				Deposit in the Postal Bank ..	719	6	9
				Cash in hand ..	6	4	9
Total ..	8,853	11	4	Total	8,853	11	4

The Circle Auditor for the Co-operative Societies, inspected the accounts of the society and passed the following remarks :—

1. The financial position of the society is quite sound.
2. It has no debt from the Co-operative Central Bank.
3. The members have been given a loan of Rs. 1,387-6-0 only.
4. Due to the carefulness of the President and the Secretary, the management is quite satisfactory.

U. P. DEPARTMENT OF AGRICULTURE, MONTHLY AGRICULTURAL REPORT.

FOR THE MONTH OF JUNE 1939.

I—Season:—Rainfall during the first two weeks was general though light. The monsoon became more active in the second fortnight. Taken as a whole it was above normal in major part of the province, Gorakhpur topping the list with 10 inches of rainfall.

II—Agricultural operations:—Agricultural operations are generally-up-to date. Preparation of land for and sowing of *kharif* crops are in progress.

III.—Standing crops and IV.—Prospects of the harvest:—The condition of the standing crops is satisfactory and the prospects are favourable.

V.—Damage to crops:—No damage to crops is reported during the month.

VI.—Condition of agricultural stock.—The condition of agricultural stock is reported to be on the whole satisfactory. The following figures furnished by the Director of Veterinary Services, United Provinces, show the cattle mortality during the month:

Disease	May, 1939		June 1939	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	6,220	3,399	6,007	3,205
Foot-and-mouth	6,730	60	2,265	22
Hæmorrhagic septicaemia	99	73	283	161

The figures indicate an increase in hæmorrhagic septicæmia while decrease in foot-and-mouth is noticeable.

VII—Pasturage and fodder.—Fodder and water are reported to be sufficient everywhere.

VIII—Trade and prices.—The following figures compare the average retail prices of the chief food grains in rupees per maund at the end of the month with those of the preceding month:

	End of May, 1939	End of June, 1939
Wheat	2·990	2·993
Barley	2·366	2·448
Gram	3·102	3·097
Rice	4·215	4·439
Arhar dal	4·868	4·871

IX—Health and labour in rural areas.—The condition of the labouring and agricultural classes is reported to be satisfactory in most of the districts. Cholera and small-pox is reported from several districts. Lucknow reports 110 deaths from cholera in June, 1939.

FOR THE MONTH OF JULY, 1939.

I—Season—The rainfall during the month of July, 1939, was general but on the whole below the normal all over the provinces, only seventeen districts recording above normal.

II—Agricultural operations—Agricultural operations are generally up-to-date. Preparation of land for *rabi* and sowing and weeding of *kharif* continue. Transplantation of late rice has been started.

III—Standing crops and IV—Prospects of the harvest—The condition of the standing crops is so far satisfactory and the prospects are favourable, but much depends on future rains. More rain is still needed in Meerut District.

V—Damage to crops—No damage to corps is reported during the month,

VI—Agricultural stock—The condition of agricultural stock is reported to be on the whole satisfactory. The following figures furnished by the Director of Veterinary Services, United Provinces, show the cattle mortality during the month.

Disease	June, 1939		July, 1939	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	6,007	3,205	3,437	2,103
Foot-and-mouth	2,265	22	1,564	15
Haemorrhagic septicaemia	283	161	1,614	1,326

The figures indicate an increase in haemorrhagic septicaemia, while a decrease in rinderpest and in foot and mouth disease is noticeable.

VII—Pasture and Fodder—Fodder and water are reported to be sufficient everywhere.

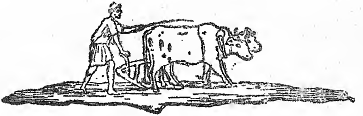
VIII—Trade and Prices—The following figures compare the average retail prices of the chief food grains in rupees per maund at the end of the month with those of the preceding month :—

	End of June, 1939	End of July, 1939
Wheat	2·993	2·942
Barley	2·448	2·608
Gram	3·097	2·935
Rice	4·439	3·627
Arhar dal	4·871	4·666

XI—Health and Labour in Rural Areas—The condition of the agricultural and labouring classes is satisfactory. Sufficient employment for them is available in the fields.

THE

ALLAHABAD FARMER



VOL. XIII] NOVEMBER, 1939 [No. 7.

An Editorial.

Reorganization of the Agricultural Department.

The Government of this province is to be congratulated on its appointment of a committee for studying the working of the Agricultural Department of this province and for suggesting ways and means as to how to improve its working for the benefit of the cultivator. The committee has a strong personnel, its chairman being Chowdhry Mukhtar Singh, whose recent books on Rural India and Agrarian Reliefs, clearly indicate what a well-informed and a great thinker he is on rural problems. The Reorganization Committee is also fortunate in having among its members Rao Bahadur B. Vishwanath, the Director of the Imperial Agricultural Research Institute, Afzal Husain, Khan Bahadur, the Vice-Chancellor of the Punjab University, and several very prominent and experienced men of the province. We hope that the labours of the committee will be crowned with success and that they will bring out a report which will be a milestone in the progress of agriculture in this province. We hope that before long other provinces also will follow suit and appoint committees that will examine the working of the Department of Agriculture in their respec-

tive provinces and to suggest ways and means which will make the department more useful to the people whom it is trying to serve.

Man and his relation to Nature and to God.

What is man; how is he related to nature, to the world around him; what is his relation to God? These are some of the most fascinating questions which have always occupied the human mind. Our belief with regard to these questions is so important, as it often influences greatly our attitude towards the world around us. It is our beliefs that also influence our actions.

When we open the Bible and look at its first pages, we find there the story of the Creation of this world. In fact it has been pointed out that there are in the first two chapters of the Book of Genesis two different stories of the Creation.

The narrative in the first of these two stories runs: "In the beginning God created the heaven and the earth." In short, the first thing in the order of creation that was created was light. Later on God made the heavens or the firmament, then the land and the sea, and all those things which we now include under the term the "vegetable kingdom." Then He made the sun, the moon and the stars, and all kinds of animals that move in the waters. Then He made all the living creatures which move upon the dry land. And when all this was done it was said that God said, "Let us make man in our image, after our likeness, and let them have dominion over the fish of the sea, and over the fowl of the air and over the cattle, and over all the earth and over every creeping thing that creepeth upon the earth. So God created man in His own image, in the image of God created He him, male and female created He them. And God blessed them, and God said unto them, Be fruitful and multiply and replenish the earth, and subdue it; and have dominion over the fish of the sea, and over the fowl of the air and over every living thing that moveth upon the earth."

According to this philosophy, man is the goal of creation. This seems to be in the mind of the writer of the Book of Genesis when he put man last in the order of creation.

This, however, does not quite express all that the writer of the Book of Genesis seems to believe. He believes, further, that man is the lord of creation, for man must "have dominion over the fish of the sea and over the fowl of the air, and over every living thing that moveth upon the earth."

This early Jewish philosophy of life is one which is in contrast with other philosophies of life which believe that man is no greater than an animal, that human life is not always superior to that of an animal; and that certain animals are even superior to human beings.

Man must have dominion; he must have the right to rule over animals. Man must have the right of absolute possession and use, he must have the right of ownership of every living thing that moveth upon the earth. This is an idea, we believe, which will make a nation have a greater control over nature. This is an idea which has made man all over the world learn how to domesticate animals, to have control of them. This is a belief which has made it possible for the nations of the world to harness nature and use it in the service of man. Waterfalls have been harnessed to produce light and heat for us, the waters of the rivers have been harnessed so that they now flow into our fields in order to produce the crops for us, tigers have been used in Australia in order to control the rabbits which infest that country, certain wasps and flies have been collected from all parts of the world in order to control the Japanese bettle that attack the fruits of America, grasses of all kinds have been bred so that they yield the grain and the fodder in abundance in the service of man.

If, on the other hand, we should believe that a grass, or a tree, or an animal is a deity, then there is not much chance for us to dare use them in our service and to make them serve us best.

India, we believe, would profit much if it adopts this philosophy of life. Much progress can be made in our control of nature, in our control of animals and plants. Indeed it is our conviction that much of the slowness in the progress of our country today is due to a very great extent to our failure to believe that man is the goal of God's creation and that he is the master of all that moves upon the earth.

A NOTE ON THE IMPROVEMENT OF GOATS IN THE UNITED PROVINCES

By

A. E. Slater, Esq., B.S.A., and S. Sardar Singh Bhatia, I.D.D. (Hons.).

Introduction.—Goats have been kept in India for very many years in large numbers but, nevertheless, very little, if any, scientific work has been done in regard to them. There is here a virgin field of the greatest importance, for Europe, England and America have long realized the value of the goat, giving to it the term the "poor man's cow". An adequate milk supply is of the greatest importance to the villager, who is often too poor to keep a buffalo or a cow, and who is even unable to purchase milk.

We would point out that whereas both the Government of India, and Provincial Governments have spent time and very large sums on the improvement of all other kinds of live-stock, not forgetting poultry, that almost nothing has yet been done to improve the "poor man's cow". The goat provides, on small quantities of feed, a nutritious and plentiful supply of milk for the cottager and humble peasant. It has clearly been demonstrated in Europe that from 5 to 7 goats can be kept as cheaply as one cow.

A word in regard to the value of goat's milk. The T. B. Bacillus has very rarely been found in goat's milk. This fact is one of great importance, more so as this dreadful disease is on the increase in India. Further, the digestibility of goat's milk is much greater than that of cow's milk or buffalo's milk. Its value for dyspeptics is shown by the fact that in New York, Chicago, and other large cities in the U. S. A. goat's milk retails for twice the price of the best cow's milk, being in much demand for hospitals and sanatoriums.

Coming now to a comparison of goat's milk with cow's milk, certain interesting facts stand out at once. Indians do

not, we believe, like goat's milk. Why? Perhaps because of its odour and taste. This is entirely a matter of management. We have produced goat's milk absolutely without odour and when offered to friends to drink, it could not be distinguished from cow's milk. The peculiar taste often associated with goat's milk is probably due to the goats having been fed on Nim leaves, which are extremely bitter, and also to the presence of the male with the milking herd. In many ways goat's milk is certainly superior to cow's milk. An important difference between cow's milk and goat's milk is this. Goat's milk is alkaline, cow's milk acid in reaction; a difference which may mean life and death to any one with a very weak stomach. Further, cow's milk requires two hours for digestion, goat's milk 30 minutes; a saving of ¾ of the work for the stomach; another life and death difference in many cases of weak digestive organs. If one studies the mineral-salt contents of three milks, *i.e.*, cow, goat, and human, it is interesting to note that there are twelve different mineral-salts found in the three kinds of milk, but not all of them in any one milk. All but three of the twelve are to be found in goat's milk, only six in cow's milk, and but five in human milk; a difference of no mean importance. Further, cow's milk is almost without iron, whereas goat's milk has from 7 to 10 times as much of that very important element, in the blood of all warm-blooded creatures. High medical authorities have said that "If cow's milk contained a little more iron it would be the 100 per cent. perfect food". It is also well known that the phosphates are bone-forming elements; of 7 phosphate salts the milk of the cow carries 0·508 parts, the milk of the goat, which is a much smaller animal, 0·319; and human milk the disproportionately small total of 0·096. When we come to the salts containing Potassium, we find the order reversed, and the small goat showing 0·483 parts to the cow 0·282; a truly remarkable thing, when we consult Webster and find him telling us that "Potassium has the most powerful affinity for Oxygen of any known substance, and takes it from every other compound." Add to this the iron content in goat's milk, and we have an Oxygen-absorbing power in goat's milk uncomparable with any other milk.

Thus has Chemistry clearly shown us, why the "poor man's cow" is so strong and vigorous, and so readily adaptable to all climates and why her milk is so super-superior as a food and also a therapeutic agent, both of which are being continually demonstrated in many thousands of cases all over the world.

It is these factors that make goat's milk an ideal feed for infants and children. In India this is of the utmost importance.

BREEDS

The following are the famous breeds of goats:—

I. Jumna Pari.—They are mostly found in the Etawah district in the United Provinces, in the tract of hilly land lying between the Jumna and the Chambal rivers and bordering on the State of Gwalior. They are dual-purpose goats combining milk and meat qualities. They are supposed to be the best Indian goats. Being of Nubian origin their butter fat percentage is very high testing on an average of 5·2 per cent. One of our goats has tested as much as 7·8 per cent. They are not bred to any standard colour or markings. They have long pendulous ears. In practice they are bred once in a year, and generally give birth to one kid. They are very hardy and are not stall-fed. They are kept by villagers mostly for meat and ghee. The average weight at birth of a Jumna Pari male is 8·5 lbs and female 7·8 lbs. The average adult male weighs from 150 to 200 lbs., and female 100 to 140 lbs. The height of a Jumna Pari adult male varies from 36″ to 40″ and length from 50 to 54″, whereas in the females, the height varies from 30″ to 34″ and length from 46″ to 50″. There is a good demand for the castrated males of this breed in big cities. Villagers castrate the males within three months of age. The average milk yield during the lactation is 540·0 lbs. and the average lactation is of 210 days. The average milk yield per day during the lactation is about 2·8 lbs. The average maximum yield a day is 4·8 lbs. The highest milk yield during a day for one of our Jumna Pari goats No. 45 is 8·4 lbs. and yield during the lactation is 1237·4 lbs.

II. Bar-Bari.—The Encyclopædia Britanica defines Bar-Bari as "The dwarf goat of Guinea goat, of Central and West Africa." It resembles a small English goat in appearance. These goats are also found on the banks of the Nile and in Mauritius, Madagascar, and Bourbon.

In India these goats are found mostly in districts of Etawah, Agra, Delhi, Gurgaon and Karnal. They are of small size and are generally spotted. They are mostly stall fed and are of dairy type like Jersey cows. They are not so valuable for open grazing conditions. In practice they kid twice in 15 to 18 months. They are not so suitable for meat because of their small size. The average weight at birth of a Bar-Bari male is 4·5 lbs. and female 4·2 lbs. The weight of an average male being 80 to 100 lbs. and female from 60 to 80 lbs. The height of a Bar-Bari male varies from 26" to 30" and the length from 38" to 42", whereas in Bar-Bari females the height varies from 24" to 28" and length 38" to 44". They are valuable goats for cities. The average milk yield during the lactation is 480 lbs. The average lactation is of 200 days. The average milk yield per day during the lactation is 2·4 lbs., and the average maximum yield a day is 3·12 lbs. The maximum yield a day for one of our best Bar-Bari goat No. 52 is 6·0 lbs. and the maximum yield during the lactation of our best Bar-Bari goat No. 211 is 781·0 lbs

III. "Beetal" goats.—These goats are found in the Punjab, specially in the districts of Sialkot, Gujranwala, Gujrat, Jhelum, and Gurdaspur. They resemble Jumna Paris of the United Provinces. They have the typical wedge-shape. The forehead is wide and the frontal bone is convex. The horns curve downwards, backwards, and slightly outwards. Generally, the male goats possess a well-defined beard, while the females are beardless. They have patches of brown tan colour on their body. They are smaller in size than Jumna Paris.

IV. "Surti" goats.—These goats are found in Western India and they resemble very much the Bar-Bari goats of the United Provinces. They are of pure white colour and of short size.

V. **"Kashmere" goats.**—These goats are found in the hilly tracts of Kashmere and Tibbet. Their body is covered with a long fine silky hair, about 4 to 5 inches in length, beneath which is the "under-wool" of such exceeding fineness that it compares with that of the Merino sheep. The under-wool grows from October to February and falls off in the Spring. The goats are combed for 8 or 10 days and the wool collected, leaving long silky hair on the animal. The average outturn of wool is from 3 or 4 oz. from each goat. These goats are very hardy and can stand very severe cold. They do not thrive in a damp climate, or in the plains.

VI. Desi goats.—These goats are found in the villages of the country. They have no standard type. They are mostly of black colour and are smaller than the Jumna Paris in size. They are very suitable for crossing with the Jumna Paris. The average weight of a female being 80 to 100 lbs., and the maximum yield during the lactation 400·0 lbs.

Breeding and Management—The presence of the buck with the females is very objectionable. The odour which it emits is readily absorbed by the milk and one of the sources of bad-flavour in milk. It should be kept in a separate place altogether

For best results it has been found that the doe should be bred when about 18 months of age. Early breeding will check the growth of the doe and the progeny will be of small size. A mature buck should breed as many as 50 to 60 does in a breeding season. He should not be used on more than 75 does during a year. The main breeding season of goats is during June and July and kidding season November and December. Goats come in heat every 21 days or so, and remain in heat for perhaps two to three days The average gestation period of a goat is 148 days.

Constant changes of diet suit the nature of the goat. Clean, fresh water, changed daily, and rock salt or salt lick should be available at all times. For the housing of goats, good ventilation dryness and cleanliness are very necessary. The floor should be raised a few inches from the

ground level and should have a slight slope to the rear. Hay racks should be used for feeding roughages. These should be placed high enough to prevent them pulling the fodder out at the top, in which case it is wasted. The grain can be fed in a bowl. The following grain mixture is recommended: Crushed gram (Chana) 2 parts and Wheat Bran (Chokar) 1 part. No grain is required during the dry period. When in milk goats should get 1 lb. of grain for every 3 lbs. of milk. Bucks during the breeding season should be given about 2 lbs. of grain mixture

Plenty of exercise is an important item, specially for the young kids which do not go out on the range for grazing. An old box or barrel for the kids to jump on and off, is useful. Their hoofs should be frequently examined and the outer shell cut back to the level of the pad. If the hoofs are neglected lameness and even foot-rot may result. Proper grooming daily is essential for maintaining sound health of the animal. With long-haired goats it is well to clip away the hair round the flank and hind legs, so far as is necessary to aid cleanliness and prevent interference with milking.

Diseases:—Fortunately the goat is, perhaps, of all domestic animals the least liable to disease, being, in fact, immune to some of the worst that attack other animals. However, a few to which they are liable are the following: -

1. *Pneumonia in Kids.*—This disease generally starts about the end of November. On the first day of an attack the kid stops taking milk, and running from the nose and eyes starts with slight fever. On the second day the fever rises and the kids start breathing fast. Sometimes abdominal breathing starts with some snoring. The temperature goes up to 105 to 106. The disease generally occurs during November, December, and January. In the acute stage they stand with their heads drooping and shoulders raised. Faeces are normal. Dams are perfectly healthy. The disease lasts about 4 to 8 days. A few of the affected cases have lingered on for about a month. Sudden changes of temperature may be the predisposing cause of the disease. Careful nursing, sufficient warmth and

fresh air are helpful. Stimulants, *i.e.*, Spirits of Nitrosi Ether and Aromatic Spirit of Ammonia, given internally are good.

2. *"Bisi"*.—The cause of this disease is due to *parasitic infection* of the stomach, intestine, and liver. The animals pick up the infection by grazing on grass growing in low spots and stagnant places during the rainy season The animal loses weight, becomes unthrifty, eats much less, membranes of the eyes and mouth become pale and there is a characteristic swelling under the lower jaw, has slight fever; in advanced stage diarrhoea appears. The course of the disease is from 10 to 15 days. The disease usually appears in the winter month. The following treatment is recommended:—

Powdered Copper Sulphate		... 2 oz.
Mustard Meal ...	...	... 2 ,,
Water ...	...	... 3 gallons.

This is well mixed together until the copper sulphate is dissolved. The dosage for full-grown goats is 2 oz. of mixture. Shake well before administering and starve the goats for 12 hours before dosing. The treatment should be carried out once a month until confident that parasities have been overcome.

3. *Mammitis or Garget.*—This disease is caused most frequently by does lying about on cold and damp ground. It starts either just before or after kidding. The symptoms are as follows:

Inflammation in the udder, rough coat, dull eyes, loss of appetite, suspended rumination, and possibly constipation. The animal stands in an awkward straddling position, and moves about or lies down with reluctance and difficulty, owing to the soreness of the udder, which will usually be found to be hot and tense, very hard, and tender. The fever, though sometimes local, is more liable to be general. A dropsical condition under the skin of the abdomen is sometimes observed.

The secretion of milk is partly or entirely suspended. The milk itself is lumpy or stringy, or its consistency may be altered to that of a serous fluid containing yellowish clots,

caused by the coagulation and separation of the casein. The secretion become purulent and offensive. Severe inflammation of the udder probably brings about a rapturing of some of the capillaries, which makes the milk bloody.

Hot fomentations should be given and the udder should be well massaged with camphor ointment and all the milk or curd should be extracted by means of a milk siphon, which should be thoroughly sterilized before using each time. The treatment should be repeated in two hours.

4. *Goat Pox.*—This disease of goats is extremely contagious. Animals get slight fever. Blisters break out on teats, udder, under tail and under hind legs. These blisters turn to scabs in about 10 days. Sometimes the disease breaks out in a very virulent form, blisters appearing over the whole of the body. The affected animals should be strictly isolated. Blisters should be bathed with a 3 per cent. solution of Granular Hypo-Sulphate of Soda. The pustules should be dressed with Zinc ointment. The affected goat should be milked last and the hands of the milker must be thoroughly disinfected after the process.

5. *Foot-and-Mouth.*—The symptoms are very similar to those noticed in cows, except that in goats the mouth is frequently not affected. The disease in adults is not serious, so that in many herds, its presence is totally ignored. The disease, however, may prove fatal to new-born kids. During the outbreak the entire flock should pass twice daily through a "Foot Dip" bath containing "Phenyle or Copper Sulphate" disinfectant. The mouths of affected animals should be washed with alum lotion at least once a day.

Economic Value of Goats.—We may point out here that the Board of Economic Enquiry, Punjab Rural Publication No. 8, states in the "Economic Value of goats": "From a food-consuming point of view the goat is the most economic of all milk-producing animals. It is very prolific and cheaply reared. It eats a class of fodder on which other animals starve to death. The goat is, therefore, the cheapest of all milk-producers.."

In the plains it is only bred by the poorer classes, mostly menials, owning little or no land and depending entirely on common grazing grounds of what can be picked up by the way."

Goats are also kept in this country by the villagers in big herds for supplying milk to cities. Breeders derive a good livelihood and make a good profit by supplying the milk to towns.

But the defect is that they do not breed them from any pedigreed stock. They breed them at a very young age, and do not castrate the males of poor milkers. They have very little grazing areas of their own, and hardly give them any grain to eat. They have been kept in India for very many years, in large numbers, but, nevertheless, with the exception of only a few Government Goat Breeding Farms started recently by the Imperial Council of Agricultural Research. Goat Husbandry in India is almost entirely in the hands of illiterate, ignorant and careless people. On the other hand, if all these Desi males could be castrated and good pedigreed Jumna Pari males could be supplied instead, this would result in much improvement, as regards meat as well as milk-production. The practice has been started in the surroundings of Districts Etah, Fatehgarh, Mainpuri and Etawah.

In the end we may point out that the Royal Commission on Agriculture in India has stated, "There are obvious directions in which the goat might be improved both as a milking and a hair-producing animal. In many parts of this, as of other countries, the goat is the poor man's cow ; and there can be little doubt that like the cow, its milk yield could be raised with little difficulty by selection. Since many breeds, or types of goat have been recognized in different parts of the country, there is reason to suppose that in the case of this animal resort to crossing might also result in considerable improvement in the milk yield. Very little attention has been given to the subject, and, in view of the hardy character of the animal, and the great need for increasing the milk supply, the possibilities of the improvement of milking strains should be explored."

AGRICULTURAL PLAN PROPOSED BY THE DEPUTY DIRECTOR OF AGRICULTURE, EASTERN CIRCLE, U.P., PARTABGARH, FOR RURAL RECONSTRUCTION WORK.

BY S. B. SINGH, M.SC., PH.D.,

Deputy Director of Agriculture, Eastern Circle, U.P.

In any scheme of agricultural development we have to keep in mind the fact that a cultivator has very little capital at his disposal and that whatever improvements are suggested they can be easily carried out by him with a little more labour. The other point which has to be kept in view is that agricultural improvements can be brought about by emphasising all the items that lead to better agriculture at the same time. Introducing better and vigorous varieties without increasing the manurial resources of the cultivators may result in general deterioration of the soil and the full advantages of better seed may not be realised by the cultivator. The following scheme is, therefore, meant to bring about a general and all-round improvement in the agricultural practices of those cultivators who can do the work with their own hands but are incapable of investing considerable amount of money :—

A. Seed.—The advantages of better seed are very well realised. Not only the yield per acre is increased but higher prices are realised on account of better quality. At present nearly all the improved seed is issued from the Government Seed-stores of the Agricultural Department on *Sawai* or on Cash-credit system. The actual supply of seed from these seed-stores is by no means adequate, specially when the cultivators usually spoil it by mixing it with *Desi* seed within a couple of years after its issue from the Government Seed-stores. He has to be taught not only how to maintain the purity of seed by separate threshing and roguing of the crop but also how to escape the payment of *sawai* interest by

keeping his own seed. If the same cultivator takes seeds year after year from the Government Seed-stores the area under improved crops cannot increase appreciably. As it is a well-known fact that every cultivator cannot keep his own seed on account of multifarious demands on his limited purse, the better living societies organised in every village can certainly run their own seed-stores on the lines of the Government Seed-stores. These Better Living Societies can get pure seed from the Government Seed-store free of interest for 5 years returnable in 5 instalments without any interest. These societies will, however, have to undertake the responsibility of keeping the seed pure and of issuing it year after year to their members. The area under improved and pure crops in each village will be often checked by the Agricultural Inspector. Some of the Better Farming Societies can also collect some seed by subscription from amongst the members which can be replaced by pure seed of improved type from the Government Seed-stores without any extra charge. The difference in the prices of the two can be borne by the Government. It will, however, not be a bad plan to replace *Desi* seed by improved pure seed, meeting the difference in prices from the Rural Development Fund to a certain extent.

If we have these societies with their seed-stores running on the lines of the Government Seed-stores it will be a great help to the members, as all the profits from *Sawai* interest will go to them and they will have pure seed of the best varieties always within their reach in the village seed-stores.

The second line of action which can be emphasised in connection with seed is the replacement of abaut 1% of the total area of cereal crops by fruit groves and vegetables. The Health Authorities have always emphasised the necessity of more vegetables and fruits in the diet of the agriculturists who at present live almost exclusively on cereals. Vegetables and fruits will not only improve the health and happiness of the cultivators but will also produce much more and better food per acre of land as compared to any cereal crops. If there are markets nearby where vegetables and fruits can be sold these crops are likely to be more profitable.

B. Manure.—As I have pointed out before, full advantages of improved seed can be derived only if the fields are also better manured. One of the chief advantages of better seed is that it responds to better manuring and better tillage by giving higher yields; but in a poor unmanured field the better seed generally does not show much better results, because in this case it is not the constitution of seed which limits the yields but it is the manurial deficiency of the soil which brings about a decrease in the yield. Unless the manurial deficiency is made up full benefit of better seed cannot be realised. The following methods for improving the manurial resources of cultivators may be adopted:—

(1) The present method of storing cow-dung in heaps leads to a wastage of about 33% through the effect of sun and rain If the cow-dung is stored in pits of proper dimensions, which will vary to some extent from cultivator to cultivator according to the number of cattle he possesses, this wastage will be stopped and he can manure a larger area as compared to the area that he manures now.

(2) Every cultivator knows that cattle urine is a valuable manure, but he generally allows it to go to waste. If he preserves all the cattle urine in the way suggested in the Departmental leaflet on the subject I am sure the manurial resources will be considerably increased as compared to his present resources.

(3) The cultivator can also utilise all the vegetable refuse for making rain-watered compost as suggested in a Departmental leaflet. It is a simple method and every cultivator can easily adopt it.

(4) He can further add to his manurial resources by green manuring and a liberal use of oil cakes and chemical fertilizers.

I may, however, emphasise once more that without proper conservation of all manurial resources in the village it is not possible to improve the standard of farming.

C. Cultivation.—(1) For better cultivation it is necessary to turn over the soil a few times during the monsoon months, so that the soil is equally weathered. The weeds that usually infest the fields are killed by ploughing the soil by soil-inverting ploughs. The roots are exposed to sun and the stems with leaves are buried in soil. Soil-inverting ploughs, therefore, not only turn over the soil but completely eradicate the weeds as well, which are the worst robbers of the soil fertility. In any scheme of Better Farming, a more frequent and liberal use of Meston Plough is, therefore, quite essential. These are sold at very cheap rates (Rs. 5-8 each, complete with wooden beam and handle) from every Government Seed-store. To popularise them in the villages, a couple of these ploughs can be placed with the Better Living Societies for demonstration purposes. The cost can be met from the Rural Development Fund.

(2) The second improvement which appears very necessary is sowing of crops in straight lines and their interculture at the young stages with Bullock Hoes. This method not only saves a good deal of human labour involved in hoeings which are very beneficial in the development of roots of crops like Arhar, Maize, Sugarcane and Groundnuts, etc. Oxygen is very necessary for the development of roots and that is supplied only by hoeing the soil and keeping it open after every irrigation. Hoeing also conserves moisture. Cheap type of Hand Hoes manufactured in Partabgarh have proved very useful for hoeing Groundnuts and Maize, etc. These can be had from the Deputy Director of Agriculture, Partabgarh, at the rate of Re. 1 each f. o. r. Partabgarh.

(3) The Bullock Power must be increased for improvement in tillage. The present poor condition of bullocks is chiefly due to two causes:—

(1) They belong to usually a small deteriorated breed and

(2) They suffer from want of proper fodder and nourishment To improve their breed it is necessary that every village has its own bull or bulls according to the number of cows. Usually one bull for every 100 cows is enough. It may be emphasised here that introduction of Government Bull cannot bring about a marked improvement in the breed when the local scrub bulls of the deteriorated type are also allowed to roam about freely with the village herd. They can either be driven out of the area in which a Government bull operates or painlessly castrated through the Veterinary Department. As regards feeding bullocks, suggestions have been made in favour of leaving pasture land or *parti* area in every village, but I feel inclined to think that the encouragement of more fodder crops is likely to yield much better results. One can easily get 700 to 800 maunds green fodder per acre from Lucerne and Berseen, 1,500 maunds from Napier grass and several hundred maunds of Juar and Oats per acre, while I have doubts whether one can get even one hundred maunds of green fodder from one acre of *parti* (uncultivated land). One acre of fodder crop under good management is likely to yield as much as 10 acres of uncultivated land. The growing of green fodder crops may, therefore, be popularised.

D. Irrigation.—The irrigation facilities can be improved in various ways according to the circumstances of a cultivator and the depth of the water-level, the situation of the village near a jhil or river or canal. Boring of good wells having about 10 to 15 feet of water should be encouraged and the use of Persian Wheels may be popularised. There are other water-lifts which can be brought to the notice of the agriculturists by the officials of the Agriculture Department. Cultivators can purchase them collectively or individually, if

any of them is likely to prove successful under their circumstances. Irrigation problem generally requires a different solution in every case according to the circumstances and no definite line can be laid down which may solve the problem of water supply everywhere. It is advisable, therefore, to consult the Agricultural Inspector in every case where water difficulty is felt. I may, however, mention that majority of the area is well irrigated and these wells, if they are deep enough, can be improved by boring and installatiou of Persian Wheels for irrigation purposes.

E. How to introduce improvements in the villages.—As the cultivators are generally uneducated and also sometime sceptic, the best way to convince them is to lay down demonstrations on their own fields. As Sir John Russell says "Cultivators' unit of time is one year and 'Safety first' being his guiding principle he cannot be easily pursuaded by words or lectures to discard old methods known to give subsistence to himself and his family until the superiority and practicability of the new ones are established beyond doubt on his own fields and under his conditions."

A field can be divided in three equal parts and the improved method or variety should be placed in the middle portion and the local method on the side plots. The middle plot by its superior growth and better yield, as compared to the two plots on either side of it, is sure to impress the cultivators. It would be better if the cost of extra labour in laying down these plots is paid from the Rural Development Fund. The Agricultural Inspector will take care that the expenses on these items do not exceed Rs. 30 per village. The demonstration of each type, however, should not be less than six in one village. If one or two fail on account of bad cultivation or bad management by some of the cultivators others will succeed and create a spirit of discussion among the cultivators. If these demonstrations are repeated for one or two years the improved methods will soon impress themselves on the mind of the cultivators and they will automatically adopt these methods in their general practice. Demons-

(Continued on page 244.)

A NOTE ON THE PREVENTION OF THE EXTENSION OF EROSION IN RAVINE LANDS AND IMPROVEMENT OF FODDER AND GRAZING IN WASTE AND RAVINE LANDS

BY

D. L. SAH, I.F.S.,

Deputy Conservator of Forests.

1. *The Forest Estate*—Due to the reckless extermination of forests by the hand of man or through excessive grazing, fires, or over-cultivation, the area covered by forests in the United Provinces has been reduced to 6 per cent. of the total area of the province and is confined almost entirely to the hills and submontane regions. This in itself by all standards is inadequate to meet the diverse demands of a progressive country (it is estimated that about 20 per cent. of the area of a country should be covered by forests). Out of the 48 districts in these provinces only 15 districts have forests of any importance. The result of this unfortunate distribution of forest growth is apparent. Thus, while in most parts of the province cow-dung is burnt for fuel, for want of any alternative, in many forest tracts vast quantities of fuel are being left untouched.

2. *The area of Ravine Land*—It is generally known that there are extensive waste aud ravine lands in Agra, Muttra, Etawah and the adjoining districts. The ravines of the Jumna and the Chambal rivers form a practically compact mass the extreme length of which is seventy miles and the width about thirteen miles in the centre. It is estimated that in the Etawah District alone there are about 120,000 acres of ravine land and there are large ravine areas in Agra, Muttra, Jalaun and other districts. A classification of land

in the province, excluding the hill *pattis* of Kumaun, is given below :—

—	Acres	Square miles	
Total area of United Provinces (excluding hill *pattis* of Kumaun).	60,500,000	94,500	
Detailed classification— Cultivation	35,550,000	55,500	
Current fallow	2,500,000	3,900	5,000
Old fallow	720,000	1,100	
Groves	1,320,000	2,060	6,500
Forest	2,850,000	4,450	
So-called culturable waste (i.e. with scattered trees, grasses, shrubs).	8,000,000	12,500	
Barren (not available for cultivation)— (1) Under water	2,730,000	4,260	15,000
(2) Sites, roads, buildings, towns, villages, railways, etc.	1,810,000	2,830	
(3) Usar and reh	1,900,000	3,000	
(4) Ravines, rocky hills, river sand, bare sand dunes, etc.	3,120,000	4 900	
Total	60,500,000	94,500	

3. *Formation of Ravines*—The land surface near the Jumna and its tributaries provides the ideal conditions for what is called "gulley erosion," *i.e.*:

(1) A soft friable soil, easily eroded, with no hard rock formation.

(2) Steep slopes, unfit for cultivation.

(3) The surface almost destitute of *all* vegetation.

(4) Monsoon rain and a long period of dry weather.

In consequence of these conditions, the Jumna basin provides one of the finest examples of gulley or ravine formation in the world!

In many parts, the vegetation on the neighbouring lands after centuries of abuse is of a very poor description and the rainfall flows away with great rapidity thereby increasing the volume and violence of the torrents and leaving their beds dry a few hours after a storm. The accumulated effect of this flooding and scouring in a hard *kankar* soil has resulted in the banks of the Jumna and Chambal being violently eroded during the last few hundred years, with a corresponding sinking of the water level.

A rough calculation has shown that the total soil erosion of the Jumna-Chambal basin is equivalent to the removal of 12 cusecs or half a ton of soil per second, day and night without stopping for the last 1,000 years.

4. *The Description of Ravines*—The banks of the Jumna and its tributaries are now so completely drained that the greater part of the areas has become almost destitute of vegetation. Cultivation beyond this desert belt is precarious even in years of normal rainfall and the presence of these ravines renders irrigation impossible. Throughout the whole extension of. this ravine land no water is to be found, except in deep wells and in the main rivers. The dry belt is increasing in extent, as the ravines eat into the flat lands at the heads every year. With the hardening effect of the tread of cattle and rapid drainage the monsoon rains penetrate to a depth of only a few inches and this quickly dries up leaving a soil almost destitute of moisture down to the water table 100 feet or more below. It has been found that the occasional scattered trees now found are of great age which have continued to reproduce themselves by coppice shoots and their root systems have kept pace with the sinking of the water level, drawing up their necessary moisture from great depths. Natural reproduction invariably dies down as soon as the rains cease. The natural vegetation of the ravine land has been destroyed by uncontrolled cultivation wherever the soil is fit for this, and by uncontrolled grazing, reckless destruction and by fires elsewhere. Large areas are now almost treeless, but the original natural vegetation was undoubtedly forest and is still forest, except in *kankar* and *usar* soils The vegetation is mostly of a xerophytic type and consists of

small trees, thorny bushes and grass—the following being the most common and characteristic :

Trees	Large shrubs or small trees	Small bushes
Prosopis spicigera (cheonkar)	Balanites aegyptiaca (hingot)	Capparis aphylla (karil)
Acacia leucophloea (reonj)	Dichrostachya cinerea (khairi)	Capparis horrida (hins)
Azadirachta indica (neem)	Zizyphus jujuba (ber)	Salvadora oleoides (pilu)
Acacia catechu (khair)		Adhatoda vasica (arusa)
		Zizyphus spp. (ber)
		Carissa spinarum (karaunda)

Acacia arabica is also found fringing the rivers and *nalas* and on moister localities, but seldom occurs in the arid ravine zone.

More important than trees and shrubs are the grasses. The most common grasses in the ravine land are *Aristida hystrix* and *Aristida depressa* both of which are practically worthless and are known as "*safed lampa*". The more valuable grasses do exist even in the most heavily grazed localities under the shelter of thorny bushes or in patches of uneven ground inaccessible to cattle.

5. *Climate*—During the cold weather (from 15th October to 15th March) there are usually occasional showers. In the hot weather, the ravines become literally furnaces with shade temperature up to 120F. and an intensely hot dry west wind blows strongly all day. Most of the monsoon rainfall occurs in July, August and September. The average annual rainfall is about 20 inches but it is very irregular.

6. *Reclamation of the Ravines*—The question of utilizing these waste lands was the subject of a report as early as 1879, but no definite action was taken in the matter for

nearly thirty years. Between 1912 and 1920 various objects of management of the ravine lands were laid down in one or more Government orders and resolutions. The main objects of the afforestation of ravine lands were :—

(1) To prevent the further erosion of ravines and to check the extension inland of the ravines.

(2) To improve the pasture and tree growth on the ravines and thus to establish fuel and fodder reserves.

(3) To grow firewood and valuable timber for sale at a profit.

As a result of the above policy of the reclamation of ravines about 16,650 acres of ravine land was taken up and planted with various species, the chief being *babul*, *sissu* and *khair*.

7. *Result of Reclamation*—The afforestation schemes started with as many as fourteen main objects of management, with the result that complete success was hardly to be expected. The attempts made to grow valuable timber have been made with many species and have been failures, as the trees do not grow to a timber size on account of the adverse climatic conditions and the *kankar* that is found in the sub-soil in many parts of the ravine land. It is now also definitely known that artificial regeneration in the ravines for the production of fuel is financially unprofitable. Further plantation was, therefore, given up in the Afforestation Division on financial grounds. But experience in the Afforestation Division has shown that controlled grazing or closure to grazing has produced excellent fodder reserves and has alone been enough to attain the object of stopping soil erosion in ravines. It is the grass and shrubs that really matter here, not trees, to prevent surface run off and therefore soil erosion. Ravine management is simply a question of control of grazing and improvement and preservation of the grasses and shrubs.

8. *Conclusions*—The conclusions from experiments on improvements of fodder and grazing in various parts of

India and the reclamation of the Jumna and Chambal ravines are :—

(*i*) Closure to grazing enormously improves the quality and quantity of fodder grasses and indigenous trees and shrubs, encourages their natural regeneration and effectively prevents soil erosion and the extension of ravines. Ravine management and prevention of extension of erosion in ravines are simply questions of control of grazing and improvement and preservation of grasses.

(*ii*) Whenever a protected area is opened to continuous or unrestricted grazing the reversion of the area to its original state with serious deterioration or almost complete disappearance of the useful fodder grasses and indigenous shrubs and trees is very rapid.

(*iii*) Closure beyond a certain period does not help in the further improvement of the grasses.

(*iv*) Cutting of grasses twice or thrice in the year gives a greater yield than a single cutting at the end of the grazing season.

(*v*) If the grasses are not cut or are not allowed to be grazed, but are allowed to rot, the quantity and quality of the grasses deteriorate within a few years.

(*vi*) Experience goes to show that the maximum permissible incidence is two acres per cow.

(*vii*) Appreciable results from the treatment applied to a grazed area may be obtained in from one to five years according to the initial condition of the area concerned.

9. *Agency for the future Management of Ravines.*— It has already been shown that simple protection from, and control of, grazing can prevent soil erosion in ravines and can greatly increase the quality and quantity of fodder without first raising any tree species. In this connection it may also be pointed out that a very large part of the ravines has

already some sort of vegetation which has been kept back by intense grazing and that such areas will quickly react to any protection against grazing. The area of such ravines is so great that a beginning can be made in these areas and if grazing is controlled the problem of soil erosion and the stopping of the extension of ravines and of providing pasture, fodder and fuel will almost be solved. There are millions of acres of waste and ravine lands in the province. When it is considered that the control and protection of the waste lands will provide considerably better fodder and grazing to the villagers, will save the zamindar valuable land from erosion and that it will not cost him anything except the cost of protection from grazing, there is no reason why the scheme should not be taken up at once.

10. Management of grazing in Ravine or Waste Land.—A scheme for the future management of the ravine land or waste land must take into consideration two important aspects:—

(*i*) That it is of primary importance to stop erosion and the extension of ravines by encouraging grasses and natural regeneration of shrubs and trees. Consequently it is necessary to give some protection to the grasses in the rains when alone erosion takes place.

(*ii*) That the scheme should be able to provide sufficient fodder and grazing for cattle throughout the year.

11. Methods of protection of grazing lands—Grazing can be controlled by any of the following methods:—

(*i*) *Periodic grazing.*—Grazing of a limited number of cattle for a definite number of years or months followed by a closure.

(*ii*) *Deferred grazing.*—Grazing a part of the area in turn, the plants in one portion being allowed to mature their seed each year before the stock is admitted.

(*iii*) *Rotational grazing.*—Restricted grazing rotating over units of the entire area. Recent researches

in pasture management have indicated a method of improved grazing which does not involve any outlay of capital. This method is called rotational grazing. The principle of rotation consists in moving a limited number of cattle from block to block within an allotted area at short intervals. This system of pasture management was developed in Germany during the war and it has since been tested and adopted by several other countries.

12. *Selection of areas for Protection.*—For producing immediate results, stimulating the interest of landowners and encouraging the villagers in their work, only the better type of ravine land should be attempted at first. There will be no difficulty in finding hundreds of acres of ravine land which are not completely denuded of tree growth and where the soil is comparatively better. Also closure to grazing and cultivation at and around the heads of the ravines is absolutely necessary to prevent the extension of ravines The total area under a scheme will depend on the number of cattle to be grazed but it is suggested that the area under any scheme should not be less than 100 acres. It should be noted that the larger the area under protection, the more pronounced will be the improvement in soil protection and pasturage. In order to produce any visible results in stopping erosion in the ravines the total area should be as large as possible—hundreds of acres instead of tens, though better pasturage alone can be provided in units of even 100 acres or less.

13. *Proposed schemes.*—The following three schemes are given in order of merit and can be tried in any waste or ravine land. It is considered that the first scheme is the best but schemes two and three will achieve a great deal and should be tried where scheme No. 1 is too difficult to try.

1st Scheme—Rotational Grazing

The best way to make full use of waste or ravine lands is to take advantage of the gregarious habit of cattle and to graze a large herd in one restricted place rather than allow

them to wander at will over a big area. Such restriction will have to be done by herdsmen provided by the villagers. In practice the blocks will have to be fairly large according to the number of cattle, allowing 2 acres of grazing land per cow (1 buffalo is taken equivalent to 2 cows). The total grazing area should be divided into 6 compartments and diffrent compartments should be grazed as given below (grazing year starts in July and ends in June of the following year):

Compartment No.	1st year	2nd year	3rd year	4th year	5th year	6th year
1st round—						
1	July, '38	June, '40	May, '41	April '42	March, '43	Feb., '44
2	Aug. ..	July, '39	June ..	Mar ..	April .	March.
3	Sept. ..	Aug. ..	July, '40	June ..	May .	April.
4	Oct. ..	Sept. ..	Aug	July '41	June ..	May.
5	Nov. ..	Oct. ..	Sept ..	Aug. ..	July, '42	June.
6	Dec. ..	Nov. .	Oct. ..	Sept. ..	Aug. ..	July, '43.
2nd round—						
1	Jan., '39	Dec. .	Nov. ..	Oct. ..	Sept.	Aug.
2	Feb. ..	Jan. '40	Dec. ..	Nov. ..	Oct. ..	Sept.
3	March	Feb.	Jan. '41	Dec. ..	Nov. ..	Oct.
4	April ..	March .	Feb. ..	Jan '42	Dec. ..	Nov.
5	May	April ..	March	Feb. ..	Jan., '43	Dec.
6	June ..	May ..	April ..	March .	Feb.	Jan., '44.

It will be seen that grazing is started in compartment 1 in July, 1938, and by the end of December, all the six compartments will be gone over. The turn of compartment 1 for grazing will again come in January, 1939. At any particular date 5 out of 6 compartments will be closed to grazing.

In order to avoid the same compartments being grazed in the rains from year to year, the rains grazing starts in different calendar months. In consideration of the area available for grazing, the area may have to be divided into 3 or 4 compartments, but the general principle of grazing will remain unchanged.

The scheme is very simple, but it is absolutely necessary that the cattle are not allowed to wander away into any other compartment which is not due for grazing (a few cattle accidently straying into another compartment now and then will not in any way affect the scheme). For this purpose reliable herdsmen will have to be provided by the villagers.

2nd Scheme—Periodic closure on three years cycle.—The grazing area available is divided into three compartments. While grazing is allowed in one part in the rains, the other two compartments will be closed to grazing in the rains. Grazing will be allowed in all compartments in winter and summer. In the following rains, the grass-cutting area will be open to grazing, while grass-cutting will be done in the area which was grazed in the previous year. The sequence of grazing and grass-cutting will be as follows:

	1st year		2nd year		3rd year	
Compartment	Rains July to October	Winter and summer (November to June)	Rains	Winter and summer	Rains	Winter and summer
1	Grazed	Grazed	Cut	Grazed	Cut	Grazed
2	Cut	Do.	Grazed	Do.	Do.	Do.
3	Cut	Do.	Cut	Do.	Grazed	Do.

The programme will be repeated in the fourth year, and so on. The incidence of grazing will be 1 cow per 2 acres.

3rd Scheme—Periodic grazing on two years cycle.—In this case the area is divided into 2 compartments. Every year one compartment will be open to grazing in the

rains and the other protected during the rains. The sequence of grazing will be as given below:—

Compartment	1st year		2nd year	
	Rains (July to October)	Winter and summer (November to June)	Rains	Winter and summer
1	Grazed	Grazed	Cut	Grazed
2	Cut	Do.	Grazed	Do.

The above programme will be repeated in the third year, and so on. The incidence of grazing will be 1 cow per 2 acres.

The third scheme is simpler to operate, but the second scheme will give better protection.

14. *Stall-Feeding and Better Breeds*—The question of improving grazing (and simultaneously stopping erosion) by imposing restriction on grazing raises the problem how to feed the *surplus* cattle and other animals that at present ruin the grazing and, by their destructive action of the vegetation with which Nature intended to cover and protect the bare slopes, cause the excessive erosion. There are two possible solutions, or preferably a combination of both, *i.e.*—

(1) Reduction of total numbers.

(2) More stall-feeding.

It is a well-recognized fact that the intense over-grazing to which the ravines and other grazing grounds in the province are subjected, by itself prevents the maximum production of fodder, and that the only way to increase the fodder supply from uncultivated lands is to reduce the incidence of grazing. In ravine areas goats in particular are most destructive to the natural vegetation.

The finest cattle in the province are to be found in districts like Meerut where the grazing grounds are a

minimum, and the worst cattle in districts such as Jhansi where the grazing grounds are a maximum. If the total number of cattle that are turned on to the grazing grounds can be reduced to a reasonable figure, the total production of fodder will be increased and thus all will benefit. For the cattle that do graze will require less cultivated fodder, which can then be given to the cattle that do not graze

It is little use to spend money on breeding bulls and improved breeds of cattle, unless the improved breeds and their progeny are *better fed*. The only way to do this is to grow more fodder on cultivated lands, and to reduce the intensity of grazing on uncultivated lands. This is one of the most important problems in the rural development of this province.

Agricultural Plan Proposed by the Deputy Director of Agriculture, Eastern Circle, U.P., Partabgarh, for Rural Reconstruction Work.

(*Continued from page 232.*)

trations have been tried in a large number of villages and they successfully convinced the cultivators of those villages about the superiority of improved methods of cultivation and seed. Schemes of Kharif, Rabi and Sugarcane Demonstrations are enclosed herewith.

F. Capital.—Some money has to be provided in the form of Takavi to cultivators who cannot purchase cheap but necessary implements and seeds.

G. Library.—A small Library consisting of a few books on agriculture in vernacular and the vernacular *Agricultural Journal* can be given to every Better Living Society for their guidance and study.

CULTIVATION OF PIPER BETLE

By

S. Chowdhury

Pan (Piper betle, Linn.*)*, a perennial dioecious creeper, probably native of Java, belonging to the family *Piperaceae* is cultivated widely for the sake of its leaves in India. According to Hobson Jobson the word *betle* is the Malayan *vettila*, i e , *veru-ila*, which means 'simple or mere leaf' and comes to us through the Portuguese *betre* and *betle*. The leaves of this plant, combined with a little slaked lime, catechu, betel nut, and some spices, such as cardamom, cloves, cinnamon, nut-megs, camphor, etc , serve as an after-table food, taken just after meals. It has the effect of extracting more saliva from the mouth and so helps digestion. But the habit of betel-chewing is often indulged in excess and it is not uncommon to see people chewing betels from morning till night, the effect of which cannot but be harmful. Well-to-do people, who can afford to pay, generally use various preparations of tobacco, such as jarda, kimam, surti, etc., with betels. The use of lime prepared from costly sea-pearls, instead of the ordinary slaked lime, was a form of luxury much in vogue amongst the Nawabs of ancient times. The *pan* leaf is a very useful ingredient in Ayurvedic medicines and the juice of the leaves is applied as a remedy for various diseases in the Ayurvedic system of treatment.

In the Surma Valley *pan* is extensively cultivated in the Khasia and Jaintia Hills and in the districts of Sylhet and Cachar. The variety of *pan* grown in the Khasia and Jaintia Hills possesses very large thick leaves and is known in commerce as the '*Khasia pan*'. In the districts of Sylhet and Cachar '*Bangla pan*', which is quite different from the '*Khasia pan*', is mainly cultivated by a class of people known as the *barui* with whom it is a hereditary profession. In some of the hilly tracts of the Sylhet and Cachar districts '*Khasia pan*' is, however, now cultivated to some extent by

the people of the Khasia and Jaintia Hills who have migrated and settled down in these tracts. In this paper the method of *pan* cultivation by the *barui* will be described.

Soil.—High land above inundation level is necessary, as stagnant water is most injurious to this crop. Black friable clay loam resembling tank earth, containing a large proportion of organic matter, is the soil most suitable for the purpose. In the districts of Sylhet and Cachar the largest number of *pan borojes* are found along river banks. This is due to the following reasons :—

(1) River bank soils are naturally more fertile and friable in nature than the ordinary arable soils ;

(2) River bank soils get easily drained ;

(3) Earthing up of *boroj* can be done easily and every year by fresh silt deposits from river beds which are rich in plant food elements ;

(4) It is much cheaper and easier to bring down bamboo thatching grass, oil-cakes, etc., by river ;

(5) Irrigation easier and less expensive ;

(6) Transportation of *pan* leaves to bazars cheaper and easier by river.

Varieties.—A large number of varieties of *pan* are cultivated by the *baruis* which are collectively known as the '*Bangla pan*'. Unfortunately hitherto no systematic study has been made of the different *pan* varieties cultivated by the *baruis.* The characters on which the *baruis* classify the different *pan* varieties are very ill-defined. Very often different names are given to the same variety in different localities. Roughly there are three main varieties—*Parua, Puathi* and *Chandana* or *Sanchi. Parua* variety is further sub-divided into *Nal Parua, Bhut Parua,* and *Jagi Parua* and *Puathi* variety into *Dhala Puathi, Lal Puathi* and *Katli Puathi.*

The *Chandana* or *Sanchi pan* is characterised by its smell. It does not grow on all soils and gives very low yield;

hence its cultivation is very limited. *Puathi* and *Parua* varieties are the most extensively cultivated. *Puathi* grows well on all soils, does not require any special care and gives high yield. *Parua*, when properly and carefully cultivated, gives the highest yield, but requires great care and supervision in the methods of cultivation.

Cultivation.—The cultivation of *pan* is attended with many difficulties; it requires a constant temperature, a fairly uniform degree of moisture and much attention on the part of the cultivator. The plant is propagated by cuttings or sets under shade within specially constructed houses of grass, reeds or mats, known as *boroj*, having flat grass roofs so designed as to admit of a diffused light.

Preparation of Land.—After selecting the land for the *boroj*, the land is thoroughly ploughed and cross-ploughed a number of times till the soil is very finely pulverized. A trench is then made all around the *boroj* to help drainage. After a number of ploughings and cross-ploughings the land is heavily manured with well-rotten cow-dung and ploughed and cross-ploughed again in order to mix the dung thoroughly with the soil. The soil is then levelled by the help of a ladder.

No other manure, except cow-dung, is applied during the preparation of the land.

Construction of the Boroj.—After the land is properly prepared *boroj* is constructed over the land. This is generally made with bamboo posts (entire and half) beams and rafters, and thatched with *ulu* grass, both on the sides and roof, tied with grass ropes and split bamboos. The *boroj* is built up to the height of a man, nearly $6\frac{1}{2}$ to 7 feet. There are no fixed dimensions as regards the length and breadth of the *boroj*; which vary according to the means of the cultivator.

Ridge and Furrows.—After the construction of the *boroj* the plot is divided into ridges and furrows. The length of the ridges and their distance apart varies with the individual *pan*-grower, but usually from $4\frac{1}{2}$ to 6 feet in length and $1\frac{1}{2}$ feet from row to row. The furrows in between the rows helps easy drainage after showers.

Supports to Creepers.—After making the rows and before planting the *pan* sets bamboo strips of the height of the *boroj* are stuck on the top of the ridges in pairs, one against the other, 7 to 10 pairs in each ridge.

Pan Sets.—The sets for planting are obtained from old plants in the *boroj*. The old vines are cut into small pieces, each containing at least six nodes; leaves are stripped off from the three lower nodes and three leaves are kept in the upper three nodes. The top part of the vine, which is very tender, is discarded. These sets are then planted at the root of each alternate bamboo strips on the ridges. The set up to the level of the lowest leaf is placed below the soil and the soil thoroughly packed up, the three leaves remaining above ground.

Time of Planting.—Time of planting varies in different localities and with the individual grower. Usually planting is done in the months of *Ashar-Sraban* (June-July), *Aswin-Kartik* (September-October), or *Magh-Falgun* (February-March).

Irrigation—Just after planting, watering becomes necessary. Plants are then irrigated frequently. The watering is done in such a way that the soil remains wet and never allowed to dry up altogether. Care is, however, taken against flooding with water which is injurious to the plant. The plants generally take roots in three or four weeks' time, after which copious watering is not necessary In certain parts of South Sylhet it is a common practice to irrigate the *pan* sets with a very thin decoction of fresh cow-dung in water after planting. Cattle urine is said to be very harmful to *pan* plants by the *baruis* and great care is taken to prevent its access into the cow-dung decoction.

In addition to watering after planting, watering of plants is done whenever necessary. No irrigation is usually required during the monsoon months.

Manuring.—When the plants have given out roots and are well established they are manured. Mustard cake is the most suitable manure for this crop. It is applied mixed

with an equal quantity of ash. This mixture is applied only to the new plants during the first two years. In old plants only mustard cake is used or when applied in mixture the quantity of mustard cake is more than that of the ash.

The mixture of mustard cake and ash or mustard cake alone is ground very fine and then applied in small quantities around the roots of the plants and afterwards covered up with earth just after manuring, both in cases of new and old plants.

During the period of manuring no watering is done for a week. If there is a shower of rain just after manuring on the same date the manure swells up in the earth, and the cultivators believe that the manure is spoiled thereby and the manuring has to be done over again.

Manuring is usually done from *Jaistha* to *Kartik* and then stopped.

Earthing.—Sometime after manuring earth is brought from river beds wherever *borojes* are situated near rivers or streams or from some other place, crushed very fine and sprinkled along the ridges and also on the furrows to be piled along the ridges in future. River silt is very highly priced for this purpose and used for earthing wherever possible.

Lowering the Creepers.—When the *pan* vines reach the roof of the *boroj*, the *pan* leaves still present in the vines are stripped off, except those young ones at the top, the entire vine is trailed on the ground along the ridge and the bud end bent upwards and tied to the bamboo strip support. This lowering is done as many times as the vines reach the roof. This operation is generally done after earthing, so after the lowering of the creepers only in the next earthing the extra portion of the stem left over the ground is covered with earth.

Removing of Roots.—When these lowered creepers take root from the portions just touching the ground or little lower where the creeper touches the ground, the extra useless stem lying on the ground is carefully removed in *Ashar-Sraban* (July-August).

Injurious Insect and Fungus Pests.—Fungus does great damage to *pan* crops. On an average 50 per cent of the crop is destroyed annually due to fungus diseases.

Insect pests are practically of no importance.

Lasting period of a Boroj.—Formerly a *boroj* used to last for 10 to 30 years, depending on the kind of the soil, the variety of *pan* cultivated, and the care taken. But on account of the prevalence of the *pan* diseases for the last 10 to 12 years a *boroj* on an average lasts for three years.

Harvesting: When planting is done in July plucking commences in October and when planting is done in October plucking commences in May. The leaves are plucked from the lower part of the plants and plucked only when the lower leaves are mature. Leaves are plucked at intervals of eight to ten days from each plant. Two to four leaves are received each time from each plant and in the rains four to six leaves. For five years the plants are in full bearing, after which there is a tendency for the yield to fall off.

Method of Packing.—The leaves, after being brought home in baskets, are sorted and counted by the female members and arranged in bundles of *puns* or hundreds. These bundles of *puns* are then packed in ordinary bamboo baskets for despatch to different places. Plantain leaves are thinly spread all over the basket and the *pan* leaves are carefully arranged in single layer and sprinkled with water before placing another layer. When the basket is full it is again covered with plantain leaves. It is then tied with rope nets or another basket is placed overturned and securely tied to prevent stealing on the way.

Cost of Cultivation.—The cost of cultivation varies in different localities. The following figures have been obtained from a veteran *pan* grower of South Sylhet. The cost is given for one *kedar** of land.

**Kedar*:—A land measure used very extensively in the district of Sylhet; it varies in different localities. The standard *kedar* is equal to 1598·71 sq. yards. (A History of the Survey of the Sylhet District by M. T. Shaw and A. B. Smart.)

1st Year.—

	Rs.	a.	p.
Cost of ploughing, cross-ploughing, laddering, etc.	6	0	0
Cow-dung, 200 mds.	7	0	0
Bamboo strips for the support of the vines ...	10	0	0
Rua Bamboo (1,500)	15	0	0
Ulu grass for thatching	25	0	0
Bamboo for posts	15	0	0
Marail (Bamboo) 125	4	0	0
Vine sets (6,000)	25	0	0
Oil-cakes, 5 mds.	10	0	0
Earth from river beds	5	0	0
Labour for constructing the *boroj*. (20 men at 8 annas per head)	10	0	0
Labour for planting the sets. (15 men at 8 annas per head)	7	8	0
Two permanent labourers for watering, manuring, earthing, plucking, etc., at Rs. 5 per head per month	120	0	0
Rent of the land	2	8	0
Total ...	262	0	0

2nd Year.—

	Rs.	a.	p.
Purchase of Bamboo	10	0	0
Ulu grass	5	0	0
Oil-cakes, 10 mds.	20	0	0
Earth from river beds	5	0	0
Two permanent labourers for watering, manuring, earthing, plucking, etc., at Rs. 5 per head per month	120	0	0
Rent	2	8	0
Total ...	162	8	0

(Continued on page 253.)

A Book Review

Note on Economics of Restriction.—The Federation of Indian Chambers of Commerce and Industry has recently issued, from its Research Department, a bulletin entitled "Note on Economics of Restriction", in which are discussed certain phases of policies of restricting production of various commodities, chiefly in Great Britain and the United States, in recent years.

It is inevitable, at a time when great efforts are being made to increase the industrial wealth of India, that every possibility of attempting to maintain commodity prices at a high level, as has been done in other countries, should be explored in this country as well. Those who are interested in the maintenance and improvement of commodity prices will be interested in the conclusions reached in this report.

The summary of the bulletin includes this passage:

"The main conclusion which emerges from the working of the restriction schemes, such as the Marketing Boards in England and the experiments under the Rooseveltian programme, is that the results achieved by the schemes were not commensurate with the cost which such schemes involved for the national exchequer and the consumers as a whole. Apart from the practical aspects of the restriction schemes, however, one fundamental question, namely, the desirability or otherwise of restrictionism, remains to be discussed. Historically, restriction of production has always become a popular theme in periods of acute economic depression and falling prices, while in periods of prosperity and good trade, all such talk has tended to disappear, and the authors of specific restriction schemes have found that the particular restriction schemes have tended to break down through the defection of individual producers who saw the opportunities of increasing their own profits by expanding their production beyond their narrowly restricted quotas. It will be seen from this that a severe recession in demand has always been at the bottom of any advocacy for the restriction of output in any line of production and that, at best, restriction of output has been adopted only as a frantic remedy to tide over

the days of depression and has been abandoned in periods of succeeding boom and prosperity. It follows from this that before embarking on a desperate measure of a doubtful utility like restriction of production, each and every country must carefully consider whether the recession in demand, which calls for restriction in any particular line of production, is likely to be a temporary or a permanent phenomenon."

Obviously it is not possible to treat this subject exhaustibly in a bulletin of twenty pages. It is apparent that many factors effecting this problem have not been considered. However, the bulletin does point out certain effects of restriction of production in other countries and suggests certain differences between conditions in India and in those countries where restriction to production has been extensively practised.

A. T. MOSHER.

(*Continued from page* 251)

3rd Year.—	Rs	a.	p.
Purchase of Bamboo	15	0	0
Ulu grass	7	8	0
Oil-cakes, 10 mds.	20	0	0
Earth from river beds	5	0	0
Two permanent labourers for watering, manuring, earthing, plucking, etc., at Rs. 5 per head per month	120	0	0
Rent	2	8	0
Total ...	170	0	0

Every fifth year the expenses is increased as thorough overhauling of the *boroj* is required. The total expenditure in 10 years is about Rs. 2,000 in round figures and the average per annum Rs. 200 per *kedar*.

Outturn.—The yield of *pan* leave varies considerably. When no damage is done to the crop by fungus pests, on an average 20 lakhs of *pan* leaves are obtained from one *kedar* of land. Taking 3,000 leaves per rupee as the average price of *pan*, the gross income per *kedar* of *pan* cultivated is about Rs. 667. The net income can thus safely be calculated as Rs. 400 per *kedar* of land per year.

U. P. DEPARMENT OF AGRICULTURE, MONTHLY AGRICULTURAL REPORT

FOR THE MONTH OF AUGUST, 1939.

I. Season.—The rainfall during the month of August was general, but below normal throughout the province, except in the districts of Allahabad, Banda, Partabgarh and Bara Banki. More rain is urgently needed in many districts. A statement showing the rainfall by districts is appended

II.—Progress of Agricultural Operations.—Agricultural operations are well forward. Land is being prepared for the *rabi*. Weeding and harvesting of the *kharif* and transplantation of rice are in progress.

III.—State of Standing Crops and IV.—Prospects of the harvest.—The standing crops are generally doing well, except where the rainfall has been scanty. In Meerut, Bulandshahr, Aligarh, Mainpuri, Muttra, Bareilly and Unao crops are reported to be suffering for want of rain. Prospects are generally favourable, but more rain is required in many districts, specially for rice.

V.—Damage to Crops.—Apart from local damage from deficiency of rain there is nothing to report under this head.

VI.—Agricultural Stock.—The condition of agricultural stock is reported to be, on the whole, satisfactory. Cattle disease is more or less prevalent in most districts and the following figures furnished by the Director of Veterinary Services, United Provinces, show the cattle mortality during the months:

Disease	July, 1939		August, 1939	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	3,437	2,103	4,673	2,884
Foot-and-mouth ..	1,564	15	5,782	78
Hæmorrhagic septicaemia	1,614	1,326	3,893	3,165

VII.—Pasturage and Fodder.—Pasturage and fodder are sufficient.

VIII.—Trade and Prices.—The following figures compare the average retail prices of the chief food-grains in rupees per maund at the end of the month with those of the preceding months:

	End of July, 1939	End of August, 1939
Wheat	2·942	3·192
Barley	2·608	2·636
Gram	2·935	3·245
Rice	3·627	4·359
Arhar dal	4·666	4·893

IX.—Health and Labour in Rural Areas.—Certain cases of cholera are reported from a few districts, otherwise there is nothing to comment.

For the Month of September, 1939

I—Season.—During the first half of the month the monsoon was very active throughout the Province and in the second half it was light to moderate. Taken as a whole the rainfall was very unevenly distributed; it was in excess of the normal in Agra and Rohilkhand Divisions while elsewhere it was less than the average. A statement showing the distribution of rainfall is appended.

II—Agricultural Operations.—Agricultural operations are generally up-to-date. Preparation of land for rabi and harvesting of kharif and picking of cotton were in progress.

III—Standing Crops and IV—Prospects of the Harvest.—The standing crops are doing well and the prospects of the harvest is satisfactory. The general yield of crops for the Province as a whole is estimated between 12 to 15 annas.

V—Damage to Crops.—There is nothing to report under this head.

VI—Agricultural Stock.—The condition of the Agricultural stock is satisfactory as a whole. Cattle diseases have been reported from some of the districts. The following figures have been furnished by Director, Civil Veterinary Services.

Diseases	August, 1939		September, 1939	
	Seizures	Deaths	Seizures	Deaths
Rinderpest	4,673	2,884	3,958	2,410
Foot-and-mouth	5,782	78	8,063	139
Haemorrhagic Septicaemia	3,893	3,165	2,706	2,225

The figures show that while the number of deaths from Foot and Mouth have increased slightly there is decrease in mortality from Haemorrhagic Septicaemia.

VII—Pasturage and Fodder.—Fodder is reported to be sufficient.

VIII—Trade Prices.—Prices of the chief food grains show a tendency to rise. The following figures compares the average retail prices in rupees per maund at the end of the month with those of the preceding month.

	End of August, 1939	End of September, 1939
Wheat	3·192	3·406
Barley	2·636	2·703
Gram	3·245	3·543
Rice	4·359	4·374
Arhar dal	4·893	4·998

IX—Health and Labour in Rural Areas.—The condition of the people is generally satisfactory. Cases of cholera have been reported from certain districts.

SUGGESTIONS FOR IMPROVING THE AGRICUTURAL INDUSTRY IN INDIA

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The Indian Agricultural Industry, compared with those of other countries of the world, is still in its infancy inspite of the fact that India has been about 85 per cent rural ever since the dawn of civilization. One still finds in India the primitive type of agricultural implements and tools in operation. It is said that it is very hard to extirpate the old ideas embedded in the minds of the Indian farmers to follow the footsteps of their forefathers. However, it can not be a far-fetched hope to expect the Indian agricultural industry to get mechanically and scientifically overhauled in a few years to come if the Government concerned take a special interest in:

1. Spreading improved seeds.
2. Advocating proper rotation of crops and proper, economical and right use and application of suitable manures to different crops.
3. Breeding better quality of dairy and draught cattle.
4. The introduction of efficient horse power on the farms in place of slow bullock power.
5. The consolidation of holdings to facilitate better and efficient management and the use of labour saving machinery.
6. The improvement of the agricultural implements and tools in use at present.
7. The encouragement of the manufacture of better implements and tools suited to the local needs of the farmers.
8. The encouragement of power farming to make agricultural occupation attractive to educated young men.
9. The encouragement of co-operative and large scale farming in order to make as much as feasible the replacement of animal power and muscle power with factor power on farms which will give to progressive farmers vastly increased efficiency, substantially lower per-acre costs, a new standard of work comfort and convenience and thus make farming really a noble and paying occupation.
10. Imparting proper academic education and practical training in the science of Agricultural Engineering and Farm Management to the students in the High Schools and Agricultural Colleges to make them emimently fit for agricultural occupation.